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DEGREE OF DIVERSIFICATION AND SYNDICATION IN THE FINNISH AND ISRAELI VENTURE CAPITAL INDUSTRY

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ABSTRACT
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DEGREE OF DIVERSIFICATION AND SYNDICATION IN THE FINNISH AND ISRAELI VENTURE CAPITAL INDUSTRY

Objectives of the Research

The objectives of the research are as follows: (1) to evaluate the degree of diversification of the Finnish and Israeli venture capital firms, (2) to identify the most important factors, which affect the degree of investment diversification, (3) to measure the extent of syndication among venture capital firms in Finland and in Israel, (4) to identify how technology affects diversification and syndication patterns, (5) to identify the most important reasons for the existence of syndication in Finland and in Israel, (6) to evaluate how syndication enables venture capital firms to diversify their portfolios across industries, venture stages, portfolio companies, and location, and (7) to identify how public funds affect venture capital markets.

Theory and Formation of the Hypotheses

The diversification-related hypotheses presented in the theory part of the study are based on Markowitz's portfolio theory and on the information-gathering costs. The hypotheses regarding syndication are based on the Pfeffers's and Salancik's Resource Exchange Model.

Data and Methodology

The empirical data of the research consists of venture capital firms' investment preferences as well as of their actual portfolio investments. The empirical analyses are based on statistical methods. In addition, a questionnaire was sent to venture capitalists in order to obtain information on the reasons for syndication.

Results of the Research

The results show that the Finnish venture capital firms (VCFs) are more industry-diversified than the Israeli VCFs. In addition, the Finnish VCFs are concentrating more on late stage low-tech ventures compared to Israeli VCFs. The Finnish early stage investors tend to be more industry-diversified than those focusing on later stage ventures. In Israel the opposite is true – the early stage VCFs are found to be less diversified across industries. The result suggests that the cost of gaining knowledge in high-tech industries is likely to be higher than in low-tech industries. Results from both sample countries are in conformity with previous results, which give support for the venture stage specialization hypothesis. The results suggest that the cost of simultaneously gaining knowledge and expertise in both early and late stage ventures is high.

According to a partial correlation analysis, industry and venture stage diversification would seem to act as substitutes for geographic scope. These results can be explained by the portfolio theory as well as by the VCF's need to find a sufficient amount of prospective ventures.

The results are in conformity with previous research, where the degree of concentration and uncertainty were found to increase VCFs' propensity to syndicate. The most important contribution of this research relates to the empirical finding of the positive relationship between the propensity to syndicate and the degree of diversification. Venture capitalists' replies to the questionnaire further validate the empirical results. Hence, the results would seem to indicate that diversification is one of the most important reasons for VCFs to syndicate.

Finally, public funds in Finland seem to behave as expected. Public VCFs tend to invest in early high-tech ventures. Public VCFs are also found to be more locally-oriented than private VCFs.

Key Words

venture capital, syndication, diversification, portfolio theory, networking, information-gathering costs

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1. INTRODUCTION

1.1. BACKGROUND OF THE STUDY

Venture capital is created to fund small and medium sized firms with significant growth potential. Small and medium sized firms, in turn, are of vital importance for the economy. Finnish small and medium sized firms employ almost 60 percent of all business employees and the share is still expected to increase[1]. Thus, venture capital market has indirect but important implications to the unemployment rate in Finland. For example in Europe, the number of employees of both venture-backed companies and top European companies increased during 1991-1995 by 15 and 2 percent, respectively[2].

Previous research has illustrated that high uncertainty and the rather long time horizon of venture capital investments makes managing financial risk crucial for venture capital firms' performance[3]. Finance theory suggests that portfolio diversification should be especially beneficial for venture capital firms operating in such an uncertain environment, yet many venture capital firms hold poorly diversified portfolios. This study aims at evaluating the costs of gaining knowledge in certain industries, technologies, and venture stages. These costs, in turn, determine the level of diversification or specialization of venture capital firms.

Although co-investments are common practice among different venture capital firms, little research has been conducted on them - with few exceptions from Bygrave[4] and Lerner[5]. Bygrave argues that information sharing, not spreading of financial risk, is the dominant reason for syndication[6]. However, other researchers[7] claim that Bygrave's results are also

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[1] Ministry of Trade and Industry. 1996. The SME Policy Programme 1996 in Finland. p 11

[2] Coopers & Lybrand Corporate Finance. 1996. The Economic Impact of Venture Capital in Europe. European Venture Capital Association. p 7

[3] Norton, E., Tenenbaum, B.H. 1993. Specialization versus Diversification as a Venture Capital Investment Strategy. *Journal of Business Venturing,* 8. p 432

[4] Bygrave, W. 1987. Syndicated investments by venture capital firms: a network perspective. *Journal of Business Venturing,* volume 2. pp 139-154

Bygrave,W. 1988. The Structure of the Investment Networks of Venture Capital Firms. *Journal of Business Venturing,* volume 3, 2. pp 137-158.

[5] Lerner, J. 1994. The Syndication of Venture Capital Investments. *Financial Management*, volume 23, 3, Autumn 1994. pp 16-27

[6] Bygrave, W. 1987. Syndicated investments by venture capital firms: a network perspective. *Journal of Business Venturing*, volume 2. p 151

[7] Norton, E. & Tenenbaum, B.H. 1993. Specialization versus Diversification as a Venture Capital Investment Strategy. *Journal of Business Venturing,* 8. p 436

consistent with the portfolio theory, which underlines the importance of spreading of financial risk. This study continues this discussion.

Previous research has studied how the uncertainty related to early venture stage, industry, and technology affect the venture capital firms' propensity to syndicate. However, a related issue of if and how diversification affects syndication has not been studied.

There are three main contributions in this study. First and the most important contribution of this study relates to the evaluation of how diversification and syndication are interrelated. Second, the study aims at identifying how government related venture capital affects venture capital markets. Third, a new method in studying syndications, that is, asking venture capitalists directly for the reasons for syndication in a form of a questionnaire is used along with the actual investment data.

In more detail, this study aims at analyzing Finnish and Israeli venture capital firms' degree of diversification and co-investing as well as evaluating the reasons for the companies to do so. Answering the research questions of this study should contribute to the theory and to practice. The theoretical contribution is a better understanding of the forces that affect venture capital firms' degree of diversification. The study will also contribute to the understanding of the influences on the venture capital firm's decision to syndicate. However, the most important theoretical contribution relates to the better understanding of the relationship between syndication and diversification. The practical contribution is expected to realize as the institutional investors, institutional venture capitalists, entrepreneurs, and policy makers became aware of the possible implications of the results.

Studying how and why venture capital firms diversify and co-invest is likely to bring more light to risk management. After all, because venture capital involves high uncertainty, asymmetries of information, and outstanding opportunities of return, it gives an opportunity to study modern financial theory in a setting of extremes[8].

1.2. RESEARCH PROBLEM

The research problem is stated in the following the question:

To what extent do Finnish and Israeli venture capital firms diversify and syndicate their investments, with whom do they syndicate, and what are the reasons for doing so?

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[8] Barry, C. 1994. New Directions in Research on Venture Capital Finance. *Financial Management*, volume 23,3. p 3

1.3. OBJECTIVES OF THE RESEARCH

The concrete objectives of the research are stated below:

1. To evaluate the degree of diversification of the Finnish and Israeli venture capital firms.
2. To identify the most important factors, which affect the degree of investment diversification.
3. To measure the extent of syndication among venture capital firms in Finland and in Israel.
4. To identify how technology affects diversification and syndication patterns.
5. To identify the most important reasons for the existence of syndication in Finland and in Israel.
6. To evaluate how syndication enables venture capital firms to diversify their portfolios across industries, venture stages, portfolio companies, and location.
7. To identify how public funds affect venture capital markets.

1.4. SCOPE OF THE RESEARCH

This research is focused on Finland, because the research is a part of a larger project concentrating on the Finnish venture capital market. Since the Finnish venture capital market is rather young and small, a comparison is made with further-developed venture capital markets, such as the US and Israel, as benchmarking them is expected to be valuable. The comparison between Finland and Israel is motivated by a number of similarities between the countries. First, both countries have small domestic markets, which puts pressure for the young companies to internationalize early. Second, both countries have a high degree of small high-tech companies.

The comparison between Finland and Israel is also motivated by a number of distinct differences between the countries. First, Israel venture capital is dominated by high-tech investments, whereas the majority of capital in Finland is invested in low-tech ventures. Second, public funds have a strong position in the Finnish venture capital industry, whereas almost all Israeli venture capital funds are private. These differences allow me to study how technology and public money influence venture capital industry.

The research focuses on institutional venture capital firms. Institutional venture capital firms are usually organized in a way that a management company administers several venture

capital funds. This distinguishes institutional venture capital firms from informal venture capitalists, such as business angels[9].

This paper views the diversification and syndication patterns from institutional investors and institutional venture capitalists perspective. The entrepreneurs' view is not considered. Hence, a crucial question is what are the benefits for institutional investors from venture capital firms' co-investing and diversification? Could the institutional investor not replicate the portfolio by investing directly to several different venture capital funds?

The research focuses on external syndications, that is, joint investments between two different venture capital firms. Internal syndications are not considered, because spreading of financial risk is the only reason for doing so, which makes internal syndication not as interesting from a theoretical point of view. Moreover first and later round syndications are only briefly discussed, due to the lack of data from Israel.

1.5. RESEARCH METHODS

1.5.1. Literature Study

As a secondary research method an extensive literature review is conducted. Literature on diversification, portfolio theory, and syndication is reviewed and synthesized. This literature is complemented by literature focusing on venture capital firms. Based on this review, a theoretical model is developed.

1.5.2. Venture Capital Industry Analysis

The empirical data of this research is based on venture capital firms' investment preferences and on actual investment data. In addition, the questionnaire shown in appendix 1 was sent to 30 Finnish and 40 Israeli venture capital firms in September 1998. This is a new method of obtaining information on the reasons for syndication. All previous studies on the subject have been based on actual investment data. The investment preferences as well as the names and the addresses of the venture capital firms were obtained from the Finnish Venture Capital Association's booklet[10] and from Israel Venture Association's booklet[11]. Additional

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[9] Turunen, H. 1995. Teknologian yritysten rahoitus. Master's Thesis in Finance Theory. Helsinki School of Economics and Business Administration. p 20

[10] Finnish Venture Capital Association, 1998. Directory of members 1998. pp 1-56

[11] Israel Venture Association. 1998. 1998 Yearbook. pp1-240

information on the yearly industry survey "Ammattimainen pääomasijoittaminen Suomessa" was used in the analysis as well as measuring how well the companies that replied to the questionnaire represented the industry overall.

The empirical data is analyzed using statistical methods. Details on the empirical methodology are given in chapter six.

1.6. DEFINITIONS

1.6.1. Institutional Venture Capital Firm

Institutional venture capital firms are companies that invest in the form of equity financing and differ from other investors in three ways. First, the investment is an active one, in other words in addition to money, venture capital firms are also providing management support to their portfolio companies. Secondly, venture capital firms have a minority holding and thirdly, the investment period is rather long but of certain length[12]. I will use the abbreviation 'VCF' to represent a venture capital firm from this point on. Institutional venture capital firms are usually organized in a way that a management company administers several venture capital funds.

[12] Alho, K., Jutila, E. 1991. Venture Capital Funds in the Development of Technology Windows and New Business Ventures of Corporations. Helsinki University of Technology. p 3

Unfortunately theory and practice are quite apart here. A recent study on European venture capital found that 39 percent of venture capital investors had, in fact, majority stakes of their portfolio companies[13]. Moreover, the venture capital industry in Europe has been investing largely in the later venture stages, such as management buy-outs (MBOs) and management buy-ins (MBIs). Finland is no exception - results from 1997 show that approximately 60 percent of the new capital invested was invested in either MBOs, MBIs, or in bridge financing[14].

1.6.2. Institutional Venture Capitalist

An institutional venture capitalist, or simply a venture capitalist, is a person working for an institutional venture capital firm, who is responsible for making investment decisions and assisting portfolio companies.

1.6.3. Portfolio Company

A portfolio company is a company that receives funding from one or several different venture capital funds.

1.6.4. Types of syndications

An external syndication occurs when the same portfolio company receives funding from two different funds, which are managed by different venture capital firms. If not specifically mentioned otherwise, the word 'syndication' refers to an external syndication in this study.

An internal syndication occurs when the same portfolio company receives funding from two different funds, which are managed by the same venture capital firm.

A first round syndications occurs when a portfolio company that receives venture capital for the first time, receives funding from two different funds, which are managed by different venture capital firms.

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[13] Coopers & Lybrand Corporate Finance. 1996. The Economic Impact of Venture Capital in Europe. European Venture Capital Association. p 4

[14] Borg, P. 1998. Ammattimainen pääoma sijoittaminen Suomessa 1997. Finnish Venturing Association ry. p 19

A later round syndication occurs when a portfolio company that has received funding from a venture capital firm, receives funding at later financial round from an another venture capital firm.

1.7. STRUCTURE OF THE RESEARCH

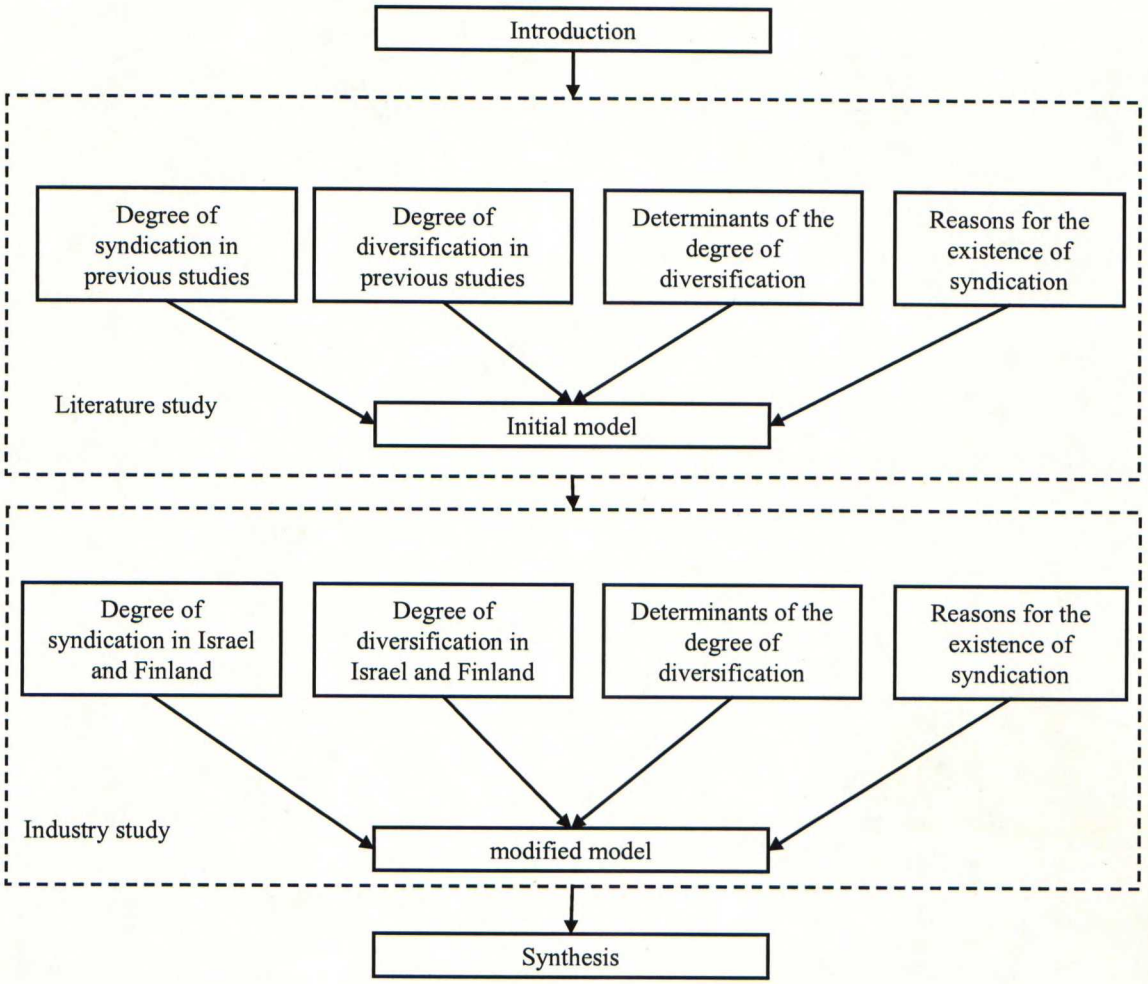

Figure 1 Structure of the research

The report is divided into nine chapters. The first chapter contains the introduction, which presents objectives of the study as well as the methodology used to obtain data and analyze it. The second chapter describes briefly venture capitalists' investment process and investment strategies, whereas previous researches on diversification and syndication are presented in chapters three and four. The fifth chapter introduces the initial model and summarizes the hypotheses presented in previous chapters. The empirical data and the methodology to analyze it are discussed in chapter six. The results from the venture capital industry analysis are then described in the seventh chapter. Chapter eight summarizes and discusses the central findings of the study and presents the final models for the sample countries. Finally, chapter nine discusses the findings in relation to literature, presents conclusions and implications of the results, and gives suggestions for further research.

2. VENTURE CAPITAL INVESTMENT PROCESS

In order to understand investment decisions, post-investment activities, and the relationship between a venture capitalist and the portfolio company, one has to understand the whole venture capital investment process, which this chapter aims to briefly describe.

Tyebjee et al [15]formed a venture capital investment activity model, which divided the process into five major parts. The process shown in Figure 2 was presented by Bygrave et al.[16] and is close to that presented in Tyebjee et al (1984), the only major difference being that the former emphasizes also exit strategies. It seems surprising that Tyebjee et al. left exit methods out of their process, since exit appears to be considered the one most important part of the process. After all, what is the use of value creation, if one cannot liquidate the capital gain? As a result, also academic literature on venture capital appears to focus on exit strategies, particularly on Initial Public Offerings, perhaps because such data is easily available for statistical analyses.

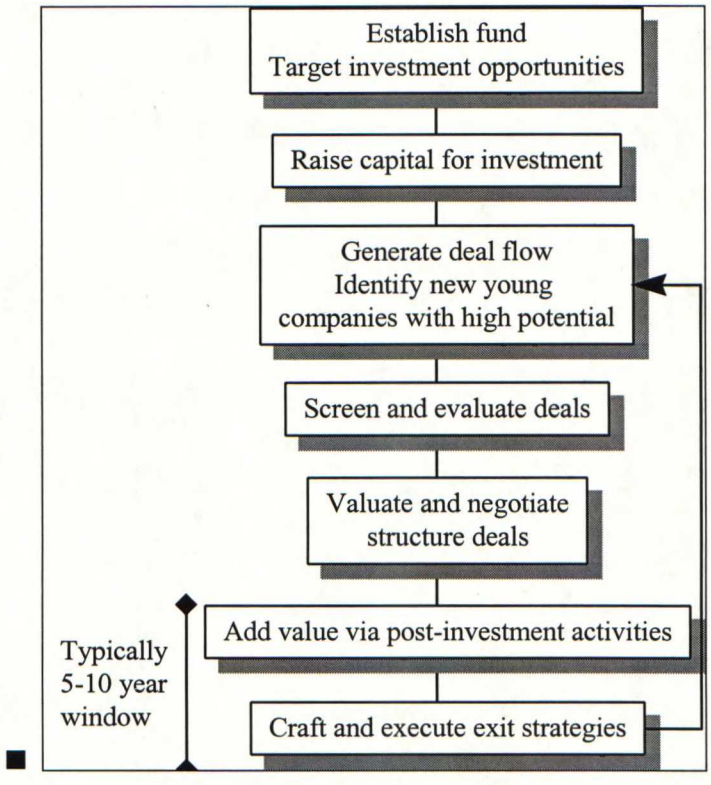

Figure 2 Classic venture capital investing process

[15] Tyebjee, T, Bruno, A. 1984. A model of venture capitalist investment activity. *Management Science*, volume 30, 9. p 1053

[16] Bygrave, W, Timmons, J. 1992. Venture Capital at the Crossroads. *Harvard Business School Press*. Boston. p 14

First, venture capitalists must decide the investment strategies for the fund. Second, they must raise capital, most often from institutional investors, such as pension funds, to build a fund. Third, venture capitalists should find and select investment opportunities that have great growth potential. If everything goes as planned, negotiations end with an investment contract. After closing the deal, a venture capitalist may add value by monitoring and assisting the portfolio company. Finally, typically after four to seven years, venture capitalists cash out through different exit methods.[17]

In essence, the venture capitalist acts as an intermediary between the original providers of capital and the portfolio company. In return for its intermediary function, the venture capitalist receives a two to three percent annual management fee and 15-25 percent of the capital gain. Original investors receive the principal and 75-85 percent of the capital gain. Typically the whole life cycle of a fund takes 10 years.[18] The management company itself follows the principle of going concern. Figure 3 illustrates the venture capital firms' role as an intermediary.

[17] Bygrave, W, Timmons, J. 1992. Venture Capital at the Crossroads. *Harvard Business School Press*. Boston. pp 10-12

[18] Bygrave, W, Timmons, J. 1992. Venture Capital at the Crossroads. *Harvard Business School Press*. Boston. pp 14-16

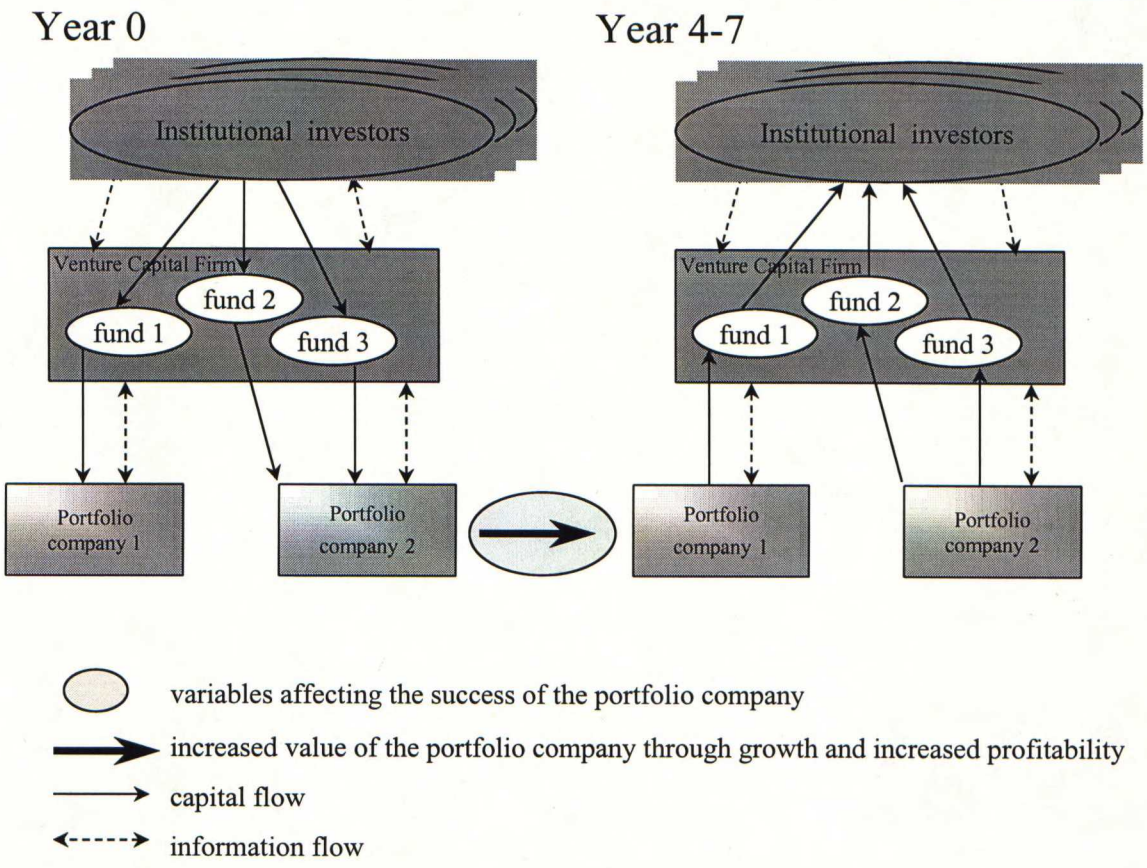

Figure 3 Relationships between a venture capital firm, institutional investors, and portfolio companies

The venture capital firm differs from a typical business company in that a venture capital firm does not engage in any operational activity itself. It acts as an intermediary between investors and newly formed growth companies. There are at least three potential ways in which venture capital firms can add value and justify their existence[19].

1. To bring investors and entrepreneurs together more efficiently than otherwise would happen[20].
2. To make superior investment decisions to those the limited partners would make on their own[21].
3. To provide non-financial assistance i.e. post-investment activities to their portfolio companies and thereby improving the venture's risk-return mix[22].

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[19] Gupta, A, Sapienza, H. 1992. Determinants of Venture Capital Firms' Preferences Regarding the Industry Diversity and Geographic Scope of Their Investments. *Journal of Business Venturing*, 7. p 349

[20] Bygrave, W. 1987. Syndicated investments by venture capital firms: a network perspective. *Journal of Business Venturing,* volume 2. p 152

[21] Sandberg et al. 1987.

Salhman claims that venture capitalists benefit institutional investors because the contracts venture capitalists negotiate address many of the moral hazard problems that may arise after the investment[23]. The extensive investment screening process reduces the adverse selection problem[24]. Fried and Hisrich argue that venture capitalists operate in a market with imperfect information and play a major role by serving as producers of information. Further, they argue that venture capitalists can obtain the information at lower costs than institutional investors would incur gathering the information directly. They state three reasons why venture capitalists have lower information-gathering costs. First, a venture capitalist is gathering the information on behalf of a number of investors, which allows him to take advantage of the economies of scale. Second, because a venture capitalist invests in a number of different portfolio companies, there are economies of scope. For example in creating an industry specific network. Third, venture capitalists benefit from a learning curve[25]. Information produced for one proposal is likely to be useful for subsequent proposals as well, which reduces the information-gathering costs.[26]

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[22] Gorman, M; Sahlman, W. 1986. What Do Venture Capitalists Do?. *Journal of Business Venturing*, 4. pp 231-248

[23] Sahlman, W. 1990. The Structure and Governance of Venture Capital Organizations. *Journal of Financial Economics*, 27. pp 473-521

[24] Fried, V, Hisrich, R. 1994. Toward a Model of Venture Capital Investment Decision Making. *Financial Management.* volume 23, 3. p 35

[25] Sahlman, W. 1990. The Structure and Governance of Venture Capital Organizations. *Journal of Financial Economics*, 27. pp 473-521

[26] Fried, V, Hisrich, R. 1994. Toward a Model of Venture Capital Investment Decision Making. *Financial Management,* volume 23, 3. p 36

3. DIVERSIFICATION VERSUS SPECIALIZATION

Sahlman has reported that over one-third of the investments by US venture capitalists resulted in total absolute losses during the 1969-1985 time frame. Only one of every 15 investments turned out to be an extraordinary success, bringing 49.4 percent of the ending value of the investor's portfolio and 61,4 percent of the investor's profit. The investment holding period averaged 4,9 years.[27] These statistics illustrate well the high uncertainty and the rather long time horizon of venture capital investments. Thus, managing financial risk is crucial for venture capital firms' performance.

The most apparent means with which venture capitalists control risk is the comprehensive screening process - in which only one to three percent of the proposals receive funding. In Finland, the percentage of investment proposals that do get funding has been around 6 percent during 1992-1997[28]. Investment criteria and due diligence processes are, however, out of the scope of this paper. I also neglect the agency risk and concentrate purely on number of firms, industry, geography, venture stage, and staged financing issues that relate to venture capital firms' risk management. Fiet found that institutional venture capitalists are more concerned with market risk than agency risk, because they have learned to protect themselves contractually from agency risk[29].

3.1. PORTFOLIO THEORY

Markowitz has demonstrated that the two relevant characteristics of a portfolio are its expected return and risk. Markowitz made three key assumptions in his portfolio theory. First, he assumed that investors prefer efficient portfolios, that is, portfolios, which maximize the expected return for a given level of risk. Second, investors will use the variability of the expected returns as an estimate of the portfolio's risk. Third, he assumed that investors are risk averse, that is, given two investment opportunities with equal expected return, investors will choose the one with the lower level of risk.[30]

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[27] Sahlman, W. 1990. The Structure and Governance of Venture Capital Organizations. *Journal of Financial Economics,* 27. p 473

[28] Information combined from six annual reports. Suomen pääomasijoitusyhdistys. 1993-1998. Ammattimainen pääomasijoittaminen Suomessa vuonna 1992-1997

[29] Fiet, J. 1995. Risk Avoidance Strategies in Venture Capital Markets. *Journal of Management Studies*, 32, 4. p566

[30] Markowitz, H. 1952. Portfolio Selection. *The Journal of Finance.* pp 77-91

The portfolio theory states that the expected return of a portfolio of assets is simply the weighted average of the expected returns of all individual assets in the portfolio. However, the risk, standard deviation or variance, of the portfolio is not as straightforward to calculate. In computing the standard deviation of a portfolio one also needs to consider the covariance between the assets in the portfolio. Covariance is a measure of the degree to which two assets move to the same or opposite direction during the same time period[31]. When a portfolio is constructed from only a few assets, the standard deviation of the return of the portfolio depends firstly, on the variances of the individual assets, and secondly, on the covariance coefficients between the individual asset pairs. The equation of how to calculate standard deviation of a portfolio of assets is shown below.

Equation 1 Standard deviation of portfolio's return

$$\sigma = \sqrt{\sum_{i=1}^{n} Wi^2\sigma^2 i + \sum_{i=1}^{n}\sum_{j=1\neq i}^{n} WiWjCov_{ij}}$$

However, when the number of assets increases in the portfolio, the covariance term becomes the dominant factor. As assets are added to the portfolio, the relative weight of the covariance term becomes greater. In fact, when the number of assets approaches infinity, the variance term approaches zero and the variance of the portfolio approaches asymptotically the sum of the weighted covariances. This is because if the assets are not perfectly correlated, the total standard deviation becomes less than the weighted average of the individual assets.

In summary, the risk of the individual assets, often called unsystematic risk, can be diversified away, but the systematic risk caused by the covariance term cannot be diversified away.[32] Numerous studies have confirmed the empirical validity of this portfolio diversification theory[33].

SYSTEMATIC AND UNSYSTEMATIC RISK

The most common components of risk are systematic and unsystematic risk. Systematic risk arises from the effects of market or economy-wide factors, whereas unsystematic risk arises

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[31] Reilly, F. 1994. Investment Analysis and Portfolio Management. Fourth edition. The Dryden Press. Orlando.

[32] Elton, E; Gruber, M. 1995. Modern Portfolio Theory and Investment Analysis. Fifth edition. John Wiley & Sons Inc. New York. p60

from company, industry, or other aspects of asset-specific risk. Unsystematic risk can be reduced through diversification. Under the assumptions of the Capital Asset Pricing Model, the financial markets, in which also venture capital firms operate, reward only systematic risk with a higher expected return[34]. Also the Arbitrage Pricing Theory assumes that investors are fully diversified and therefore exposed only to systematic risk influences[35]. Thus, finance theory in general, assumes diversified investors, that is, all firm or industry specific risk ought to be diversified away.

The Capital Asset Pricing Model includes assumptions - such as homogenous investor expectations, no transaction costs, and equal access to relevant information - which may not hold in the risk capital market[36]. For example, venture capital firms, like any other financial intermediary, may possess information or transaction cost advantages over other investors, which justify their existence. Sahlman argues that the beneficial learning curve effect arises from specializing in certain industries, which in turn provides access to networks[37]. Levy's Generalized Capital Asset Pricing Model introduced capital market segments, which arise from the fixed costs of gaining information[38]. Merton, on the other hand, pointed out that investors might possess specialized information in the field of their expertise. He argues that investors will invest only in those companies they are already well informed of, and omit all business areas unrelated to their specialized expertise[39]. All of these arguments give insight to the functioning of the risk capital market and possible explanations to why we see so many poorly diversified venture capital firms in the capital markets.

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[33] see for example Eun & Resnick. 1984. Estimating the Correlation Structure of International Share Prices. *Journal of Finance.* pp 1311-1324

[34] Sharpe,W.F. 1964. A Theory of Market Equilibrium under Conditions of Risk. *Journal of Finance.* pp 425-442

[35] Ross, S. 1976. The Arbitrage Theory of Capital Asset Pricing. *Journal of Economic Theory.* pp343-362

[36] Sharpe,W.F. 1964. A Theory of Market Equilibrium under Conditions of Risk. *Journal of Finance.* pp 425-442

[37] Sahlman, W. 1990 The structure and Governance of Venture capital organizations. *Journal of Financial Economics.* p500

[38] Levy, H. 1991. Possible Explanations of non-synergy merger and small firm effect by the generalized CAPM. *Review of Quantitative Finance and Accounting*, 1, 1. pp 101-128

[39] Merton, R.1987. A Simple Model of Capital Market Equilibrium with Incomplete Information. *Journal of Finance,* 42,3. pp 483-510

3.2. INDUSTRY DIVERSIFICATION

After studying 53 venture capital firms, Robinson et al pointed out that venture capital firms will differentiate according to high-to-low levels of staff assistance*, size of investment, sources of equity capital, and degree of vertical integration in the level of the generation-to-management of investments chain[40]. Bygrave drew attention to the importance of industry-specific knowledge. He suggested that "expertise, especially industry-specific knowledge on markets and technology, is an important – perhaps the dominant – determinant of venture capitalists' investment behavior. Therefore, we believe that the industry-specific knowledge will play a major role in future segmentation of the venture capital industry"[41].

Because many industries have low correlation with each other, investing in different industries enables an investor to take advantage of the portfolio diversification. Also venture capitalists can reduce unsystematic risk by diversifying their investments across several different industries similar to mutual funds, which can invest in different publicly traded companies in different industries.

Although portfolio diversification is a well-known means of minimizing unsystematic risk, Bygrave argues that maintaining a high degree of specialization may be useful for controlling risk as well as gaining access to networks, information, and deal flow from other venture capitalists[42]. Moreover, to diminish information asymmetries and the risk of adverse selection, investors invest in familiar industries to be in a better position to assess the venture's profit potential.

If the risk-return mix were viewed as unalterable, i.e. if the venture capital firm was not creating any additional value beyond capital, venture capital investments by venture capital firms would be similar to any other portfolio of passive investment. In such case, the well-proven heuristics suggested by financial economics, e.g. Sharpe[43] 1981, should apply. Hence, Finance theory suggests that those venture capital firms focusing on early venture stage, that

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* similar to the Close-tracker –laissez-faire -categorization in MacMillan, I; Kulow, D; Khoylian, R. 1988. Venture Capitalists involvement in their investments: extent and performance. *Journal of Business Venturing,* volume 4. pp 27-47

[40] Robinson et al. 1986

[41] Bygrave, W. 1987. Syndicated investments by venture capital firms: a network perspective. *Journal of Business Venturing,* volume 2. p 153

[42] Bygrave,W. 1988. The Structure of the Investment Networks of Venture Capital Firms. *Journal of Business Venturing,* volume 3, 2. p 139

is, more risky investments should prefer greater industry diversification.[44] If venture capital firms seek to control unsystematic risk by way of portfolio diversification, the following hypothesis should be true:

H1a: *Venture capital firms that invest mainly in early stage ventures will prefer investment opportunities within a more diverse set of industries than other venture capital firms.*

However, should the risk-return mix be partially alterable due to venture capital firm's involvement and assistance, then the need to develop specialized industry knowledge and experience, and working in close interaction with the ventures, is likely to act as a strict constraint on the venture capital firm's preference for high industry diversification. Furthermore these constraints can be expected to have a more severe impact on those venture capital firms that focus on early stage ventures. Early stage technology-based venturing usually requires deep understanding of the underlying technology to assess its value, which would suggest a focused approach. Moreover, later stage ventures, such as management buy-outs, can be fairly easy to make regardless of the industry, because buyouts require more financing know-how than industry know-how.

Due to venture capital firms' expertise and information advantage in certain industries and technologies, and given the high fixed costs of gaining the similar knowledge in other unrelated industries and technologies, it would seem uneconomical for a venture capitalist firm to pursue an extensive portfolio diversification strategy. Thus if information sharing and specialization are means of controlling risk, I have the following hypothesis:

H1b: *Venture capital firms that invest mainly in early stage ventures will prefer investment opportunities within a less diverse set of industries than other venture capital firms.*

Gupta and Sapienza studied the preferences for portfolio diversification of US venture capital firms. The study suggested that venture capitalists that focus on early stage ventures are

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[43] Sharpe, W. F. 1981. Decentralized investment management *Journal of Finance*, volume 36, 2. pp 217-234

[44] Gupta, A, Sapienza, H. 1992. Determinants of Venture Capital Firms' Preferences Regarding the Industry Diversity and Geographic Scope of Their Investments. *Journal of Business Venturing*, 7. p 350

smaller and less industrially diversified than those concentrating on later stage ventures[45]. Hence, their results are in favor of the specialization hypothesis. One quite obvious reason is that larger venture capital firms have more human resources and are more capable of diversifying their portfolio.

Norton et al. have studied diversification of American venture capital firms. Their study, which covered 98 venture capitalists, found also evidence favoring the specialization hypothesis. They found that investors in seed and first stage financing deals were less diversified across industries and firms[46].

3.3. VENTURE STAGE DIVERSIFICATION

Venture capitalists are subject to a great amount of unsystematic risk in each of their portfolio companies, especially those focusing on early stage ventures. Figure 4 illustrates the factors underlying the discount rates, which venture capital firms use to value companies. These factors are: to provide a base return at least equal to the risk free rate, to provide compensation for risk bearing, to compensate for illiquidity, to take into account the value added by the venture capitalist, and to adjust future cash flow projections to reflect experience and skepticism.[47]

Elago et al found that venture capital firms focusing on early stage sought ventures with higher potential returns – a 42 and 33 percent hurdle rate of return for early stage and late stage venture capital firms, respectively[48]. While early stage investments have generated higher returns in the US[49], European early stage funds have generated significantly poorer

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[45] Gupta, A, Sapienza, H. 1992. Determinants of Venture Capital Firms' Preferences Regarding the Industry Diversity and Geographic Scope of Their Investments. *Journal of Business Venturing,* 7. p 357

[46] Norton, E., Tenenbaum, B.H. 1993. Specialization versus Diversification as a Venture Capital Investment Strategy. *Journal of Business Venturing,* 8. pp 439-440

[47] Harvard Business School. 1987. A method for valuing high-risk, long-term investments. Teaching note 9-288-006. p 17

[48] Elango, B. Fried, V. H. Hisrich, R.D. Polonchek, A. 1995. How Venture Capital Firms Differ. *Journal of Business Venturing,* 10. p 167

[49] Bygrave, W, Timmons, J. 1992. Venture Capital at the Crossroads. *Harvard Business School Press*. Boston. pp 149-165

returns than MBO funds[50]. Lumme et al. suggest that the results may reflect a scarcity of classic venture capital skills in Europe[51].

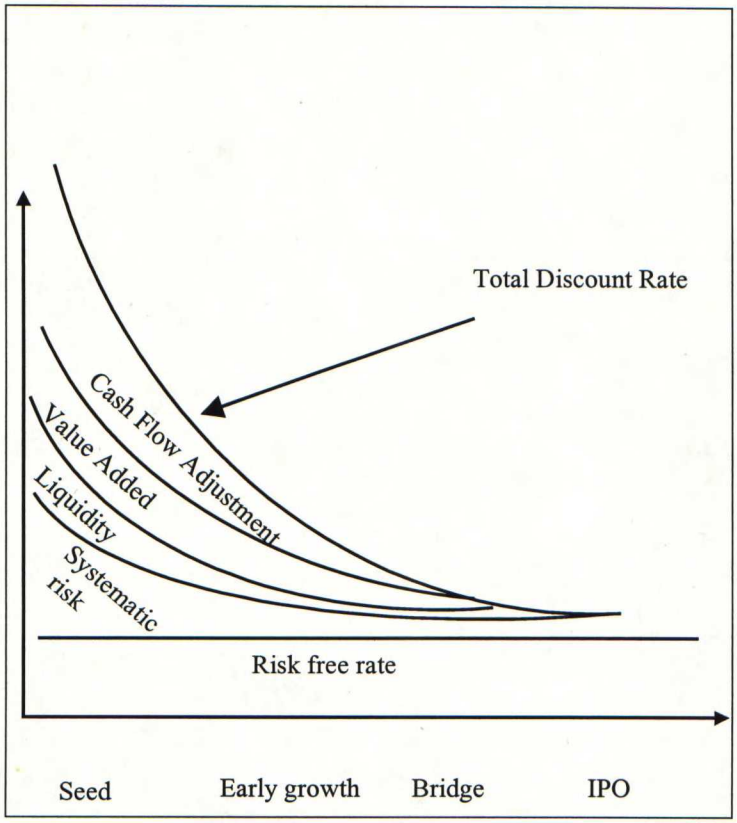

Figure 4 Factors underlying discount rates[52]

Gupta and Sapienza list four sources of uncertainties, which make early stage ventures more uncertain than what more established firms are:[53]

1. more demand uncertainties (customer base, acceptance)
2. technological uncertainties (product & process)
3. resource uncertainty (availability of skilled personnel, dependability on key personnel, raw materials, channels of distribution)
4. management uncertainties (founder, management team, balance)

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[50] BVCA. 1996. Press release: Independent venture capital funds increase returns to investors. London. British Venture Capital Association.

[51] Lumme, A, Mason, C, Suomi, M. 1998. Informal Venture Capital: Investors, Investments and Policy Issues in Finland. Kluver Academic Publishers. Boston. p 9

[52] Harvard Business School. 1987. A method for valuing high-risk, long-term investments. Teaching note 9-288-006. p 18

[53] Gupta, A, Sapienza, H. 1992. Determinants of Venture Capital Firms' Preferences Regarding the Industry Diversity and Geographic Scope of Their Investments. *Journal of Business Venturing,* 7. p 350

Based on finance theory, one would expect the desire to diversify to be stronger for those venture capitalists with large relative commitments to the seed and first stage investments.[54]

Liquidity risk is another source of unsystematic risk. Liquidity risk can be divided into two aspects. The first aspect is company specific, i.e. the difficulty in exiting from an unsuccessful investment. This difficulty depends on numerous factors. To reduce company specific liquidity risk, portfolio diversification theory suggests that venture capitalists would be better off by constructing a well-diversified portfolio. The second aspect of liquidity risk deals with the timing of exit of a successful venture. There seems to be good and bad periods to cash out in the public equity market, e.g. IPO market. During good or "hot" times the valuations of small businesses are high compared to bad or "cold" times. According to portfolio diversification theory, venture capitalists should try to minimize the timing liquidity risk by not only trying to seek to diversify across firms and industries but also across different financial stages[55]. Thus, if portfolio diversification is a means of controlling venture stage risk, I have the following hypothesis:

H2a: *Venture capitalists seek to control unsystematic liquidity risk will lead them to diversify across several different venture stages.*

Again one might argue that due to venture capital firms' expertise and information advantage in certain venture stages, and given the high fixed costs of gaining the similar knowledge in other unrelated venture stages, it would seem uneconomical for a venture capitalist firm to pursue an extensive venture stage diversification strategy. Thus if information sharing and specialization are means of controlling risk, I have the following hypothesis:

H2b: *The venture capitalists' strategy to specialize in order to enhance their position in networks and information sharing flows will lead them to concentrate in one financing stage or several consecutive financing stages.*

Norton et al.'s study, which covered 98 venture capitalists, found evidence favoring the specialization hypothesis. They found that venture capitalists appeared to specialize in certain

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[54] Norton, E., Tenenbaum, B.H. 1993. Specialization versus Diversification as a Venture Capital Investment Strategy. *Journal of Business Venturing,* 8. p 434

[55] Norton, E, Tenenbaum, B.H. 1993. Specialization versus Diversification as a Venture Capital Investment Strategy. *Journal of Business Venturing,* 8. p 434

financial stages rather than stagger their investments over different venture stages. There was a significant positive relationship between nearby stages as a result of follow-on investment and a negative relationship between financial stages that were not consecutive.[56]

3.4. GEOGRAPHIC DIVERSIFICATION

If the asset universe is expanded outside state or national borders so that also other than domestic assets are included, we have a much larger variety of assets to invest in. It should be intuitively clear that it should be easier to find assets, which are less correlated with each other. One of the key issues in determining the benefits from geographic diversification is that the investor must be able to find investment opportunities, which could not be found in local markets. If the foreign assets are duplicates of those found domestically, then there are no new real investment opportunities for investors and, therefore, no additional benefits from geographic diversification.[57]

Asset returns are usually much less correlated across different countries than within a single country, because economical, political, institutional and psychological factors, which all affect assets' returns, lead to lower correlation among international assets compared to domestic assets. Several empirical studies have confirmed that inter-country correlation coefficients are indeed lower than intra-country ones[58]. These results imply that investors should be able to substantially gain from geographic diversification in terms of risk reduction.

Haavisto and Hansson studied diversification within the Nordic stock markets and found that the correlation coefficients between the Nordic markets were surprisingly low, even though the Nordic region is often considered to be fairly homogenous in terms of economic, political, and social environment. They suggested that the low correlation could partially be due to the differences in the industrial structure of the countries.[59] If their argument is true, there is less potential for venture capital firms, especially those focusing on few industries, to benefit from Nordic geographic diversification.

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[56] Norton, E, Tenenbaum, B.H. 1993. Specialization versus Diversification as a Venture Capital Investment Strategy. *Journal of Business Venturing,* 8. p 440

[57] Elton, E; Gruber, M. 1995. Modern Portfolio Theory and Investment Analysis. Fifth edition. John Wiley & Sons Inc. New York. pp 263-264

[58] Eun & Resnick. 1984. Estimating the Correlation Structure of International Share Prices. *Journal of Finance.* December 1984. 1311-1324

[59] Haavisto, T; Hansson, B. 1992. Risk Reduction by Diversification in the Nordic Stock Markets. *Scandinavian Journal of Economics,* volume 94, 4. pp 581-588.

A more recent study by Liljeblom et al. suggests that the correlation between national stock markets has increased, especially in the Nordic region. This further reduces the benefits, which can be obtained from geographic diversification. One explanation is that the large corporations have become increasingly international[60]. Since most of the venture capital firms' portfolio companies are also aiming at international markets and many of them, despite of their small size, are operating internationally, the above statement applies well to venture capital backed companies. Nevertheless geographic diversification can still be regarded as a highly potential means of reducing unsystematic risk.

Sapienza et al's research has shown that US venture capitalists seem to change their level and nature of involvement in accordance with situation specific factors. They discovered that US venture capitalists were more highly involved and in more frequent interactions with the portfolio company if it was in its early venture stage[61]. Because an early venture stage requires more face-to-face interaction, it would seem desirable for venture capitalists that the portfolio companies would locate close to the venture capital firm's office. Thus, the following hypothesis:

H3a: *Venture capital firms that invest mainly in early stage ventures will prefer investment opportunities within a narrower geographic scope than other venture capital firms.*

As mentioned earlier Gupta and Sapienza studied the preferences for portfolio diversification of US venture capital firms. The study suggested that venture capitalists that focus on early stage ventures are less geographically diversified than those concentrating on later stage ventures[62]. Elago et al. found that venture capital firms, which invest in early stage or small late stage ventures, tend to be geographically concentrated. They claim that venture capital firms making large investments can spread the fixed transaction cost of travel and the opportunity cost of the travel time over a larger investment[63].

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[60] Liljeblom, E, Löflund, A, Krokfors, S. 1995. The Benefits from International Diversification for Nordic Investors. *Svenska handelshögskolan working papers*, No. 295.

[61] Sapienza, H; Amason, A; Manigart, S. 1994. The Level and Nature of Venture Capitalist Involvement in Their Portfolio Companies: A Study of Three European Countires. *Managerial Finance,* volume 20, 1. pp 3-6

[62] Gupta, A, Sapienza, H. 1992. Determinants of Venture Capital Firms' Preferences Regarding the Industry Diversity and Geographic Scope of Their Investments. *Journal of Business Venturing,* 7. p 357

[63] Elango, B. Fried, V. H. Hisrich, R.D. Polonchek, A. 1995. How Venture Capital Firms Differ. *Journal of Business Venturing,* 10. p 170

Distance to the portfolio company has been found to affect venture capitalists' level of involvement in their portfolio companies. Sapienza et al. have found that distance to the portfolio firm reduces the level of involvement[64]. Lerner's results are in conformity with this. He found that distance to the firm is negatively related to the board membership of venture capitalists[65].

According to portfolio theory industry-, venture stage-, and geographic- diversification can be used as alternative means of diversifying one's portfolio. Hence, they are in some sense substitutes for each other. For example, an investor can compensate the lack industry diversification by diversifying across a larger number of venture stages or across broader geographic scope. In addition, information-sharing hypothesis pulls to this same direction. I argue that in order to maintain a sufficient number of deals a VCF specializing in certain industries must look for investment opportunities within a broader geographic scope. For example, a VCF focusing purely on biotechnology cannot afford to look for portfolio companies only from Southern Finland, it simply must have a broader geographic scope in order to receive sufficient deal flow. Thus, I hypothesize

H3b: *Venture capital firms that invest within a less diverse set of industries will look for investment opportunities within a broader geographic scope than other venture capital firms.*

This question has not been stressed before in literature. Although Gupta et al. did not study the relationship between the industry diversification and geographic scope, a significantly positive correlation is shown in a correlation table in their paper[66]. This result suggests, although not mentioned by the authors, that those venture capital firms with well industry-diversified portfolios also tend to prefer a larger geographic scope. These results are opposite to what I hypothesized.

3.5. Capital Resources

Unlike in the typical operating company, the growth of a venture capital firm's size comes exclusively through infusion of fresh capital by outside investors. Investors are unlikely to

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[64] Sapienza, H & Manigart, S & Vermeir, W. 1996. Venture Capitalists Governance and Value Added in Four Countries. *Journal of Business Venturing,* 11. p 460

[65] Lerner, J. 1995. Venture Capitalists and the Oversight of Private Firms. *Journal of Finance*, 1. p 314

[66] Gupta, A, Sapienza, H. 1992. Determinants of Venture Capital Firms' Preferences Regarding the Industry Diversity and Geographic Scope of Their Investments. *Journal of Business Venturing,* 7. p 356

overlook past performance when making investment decisions. Thus, one can argue that those venture capital firms, which can show a convincing track record, are in a better position to obtain new funds and to grow. This logic implies that those venture capital firms with a larger pool of funds are assumed to possess a larger accumulated base of capabilities than those venture capital firms with a small amount of capital under management do.[67]

Gupta and Sapienza name the three following reasons to why venture capital firms' size is expected to be related to industry diversity and geographic scope. First, larger venture capital firms are more likely to need a large set of investment opportunities. Second, larger venture capital firms probably possess an extensive network, which offers more potential deals. Third, large venture capital firms may have accumulated superior capabilities, which allow them to invest in a wider set of industries[68]. I assume that similar reasoning applies in Finland as well, and therefore, my hypotheses are as follows:

H4a: *Venture capital firm with a larger pool of capital under management will prefer venture investments within a more diverse set of industries than other venture capital firms.*

H4b: *Venture capital firm with a larger pool of capital under management will prefer venture investments within a broader geographic scope than other venture capital firms.*

Gupta and Sapienza did indeed discover that larger venture capital firms were more industry and geographically diversified[69]. According to Sadtler, most venture capitalists, in UK feel they do not have the luxury to specialize in some specific industry, because they want to assess as many investment proposals as possible in order to pick out the few winners. Recently however, some larger firms have recruited specialists and built relevant business portfolios around them.[70]

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[67] Gupta, A, Sapienza, H. 1992. Determinants of Venture Capital Firms' Preferences Regarding the Industry Diversity and Geographic Scope of Their Investments. *Journal of Business Venturing,* 7. p 352

[68] Gupta, A, Sapienza, H. 1992. Determinants of Venture Capital Firms' Preferences Regarding the Industry Diversity and Geographic Scope of Their Investments. *Journal of Business Venturing,* 7. p 352

[69] Gupta, A, Sapienza, H. 1992. Determinants of Venture Capital Firms' Preferences Regarding the Industry Diversity and Geographic Scope of Their Investments. *Journal of Business Venturing,* 7. p 358

[70] Sandtler, D. 1993. How Venture Capitalists Add Value.. *Journal of General Management*, volume 19, 1. p 8

3.6. PUBLIC VERSUS PRIVATE SOURCES OF FUNDS

Public funds have historically dominated venture capital industry in Finland. Figure 5 shows the share of capital under management of public and private venture capital firms. At the same time, private money has increased its share, the investment focus has moved to later stage ventures, as can be seen in Figure 6. This trend poses a question –what are the differences in investment behavior that are related to the origin of capital.

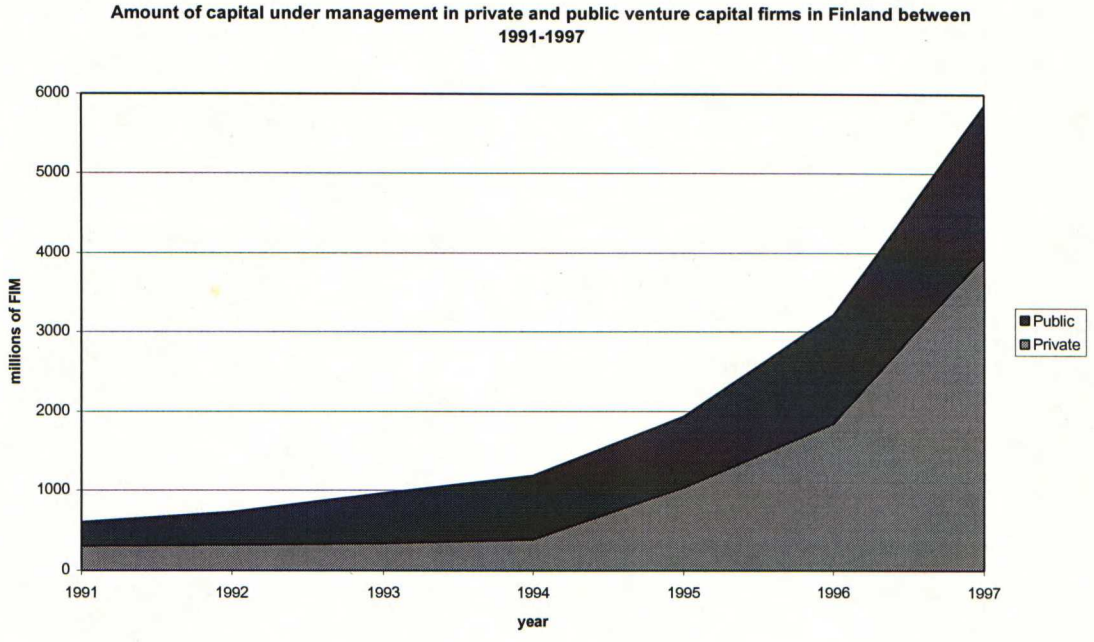

Figure 5 Amount of capital under management held by public and private venture capital firms in Finland during 1991-1997

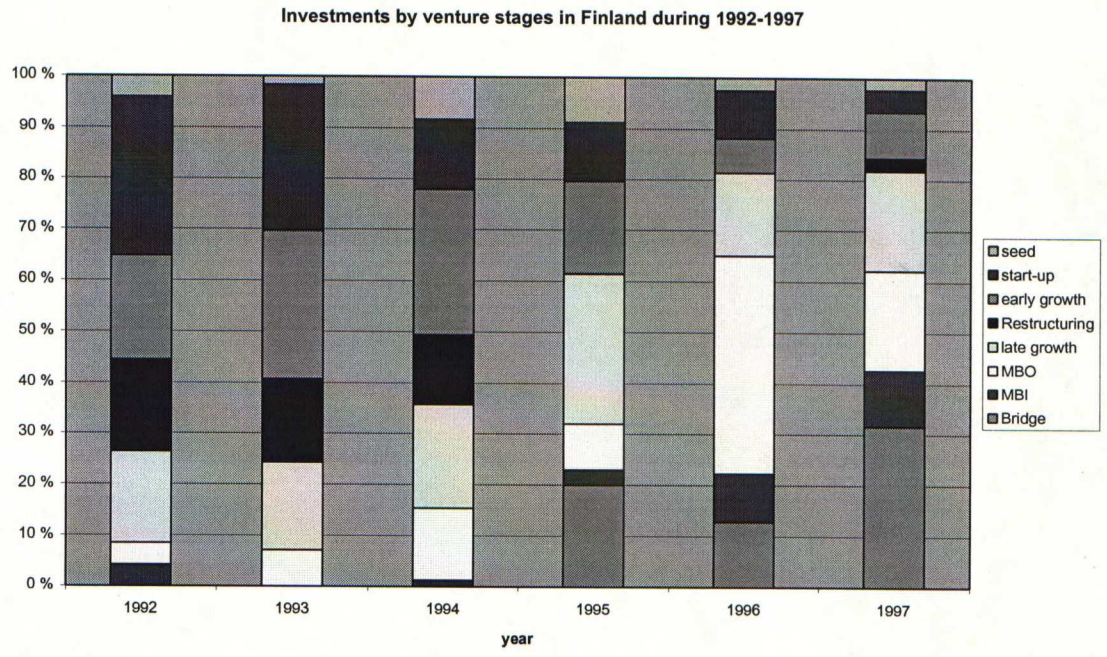

Figure 6 Capital invested by venture stages in Finland during 1992-1997

Many public funds have stated in their mission statements that their primary goal is to help small companies to grow. Even some of the names like Start Fund of Kera and Spinno-seed give a clear picture of the venture stage to which the money should go. Moreover, government is promoting high technology in Finland. For example TEKES gives subsidies and grants to small technology-based companies.

Private and public funds may have different attitudes towards risk and return. Where private firms compete in the capital markets, where the investment decisions must be based purely on the expected return and risk, public funds may have additional investment criteria. Government related financial institutions are more likely to be pursuing to help young technology-based companies grow than invest in mature low-tech firms. Private funds, on the other hand, are not as strict about their venture stage or industry focus, if the expected return is adequate for the associated risk. Thus I hypothesize the following:

H5a: *Venture capital firm with public sources of funds will focus more on high-tech industries than private venture capital firms.*

H5b: *Venture capital firm with public sources of funds will prefer more early stage ventures than private venture capital firms.*

Gupta and Sapienza discovered that public capital funds tend to be more geographically concentrated than privately financed funds in the US. There also was an insignificant negative

correlation between public funds and industrial diversity, suggesting that public funds tend to be less industry diversified. This is somewhat surprising since US public funds preferred significantly more later stage ventures than private venture capital firms.[71]

3.7. STAGED FINANCING

Venture capitalists typically fund firms in staged capital commitments, where money is given to a company based on some predefined milestones. According to Gorman and Sahlman, venture capitalists tend to give only the minimum money required, in discrete amounts closely matched to the attainment of milestones. They suggest that through staged financing, venture capitalists are able to limit damage by refusing additional financing, in case the company is unsuccessful in early stages.[72] Perhaps the best way to understand this is to think of a decision tree, where the opportunity to make the decision in the future is valuable because more information of the possible outcomes is then available. This opportunity can be thought of as a call-option.

3.8. INSTITUTIONAL INVESTORS' VIEW

Pension funds have allocated only a couple of percent of their funds into venture capital funds. Why should venture capital firms diversify if the institutional investors can do it themselves? Arbitrage guarantees that institutional investors are unwilling to reward venture capital companies from diversification which they can replicate themselves at no greater costs[73]. The question then becomes one of related synergies and of how well venture capital firms communicate their investment strategies to the institutional investors. If there are high costs of obtaining information and gaining knowledge in certain industries or venture stages, then venture capital firms ought to specialize in related areas and inform institutional investors well of their investment strategies. This information would help the institutional investor better manage his portfolio's risk.

Norton et al drew attention to venture capitalists' diversification from institutional investors' point of view by stating the following question. "Why aren't venture capitalist "supermarkets" more prevalent? Venture capitalist supermarkets can allow the best of both worlds – an overall portfolio diversified in terms of time and industry, with experts overseeing sub-

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[71] Gupta, A, Sapienza, H. 1992. Determinants of Venture Capital Firms' Preferences Regarding the Industry Diversity and Geographic Scope of Their Investments. *Journal of Business Venturing,* 7. p 358

[72] Gorman, M; Sahlman, W. 1986. What Do Venture Capitalists Do?. *Journal of Business Venturing,* 4. p 238

portfolios that are specified in terms of industries and financing stage."[74] One possible explanation is that the learning curve of a VCF is steeper when there are several individuals in the same organization that can accumulate knowledge in one industry or venture stage.

[73] Shapiro, Alan. C.1996. Multinational Financial Management. 5th edition. Prentice Hall International Editions.

[74] Norton, E, Tenenbaum, B.H. 1993. Specialization versus Diversification as a Venture Capital Investment Strategy. *Journal of Business Venturing,* 8. p441

4. VENTURE CAPITAL NETWORKS AND THE DEGREE OF SYNDICATION

Uncertainty dominates the venture capital industry, especially the early-stage innovative ventures. Good information and experience are vital in order to make good investment decisions. It has been said that 100 decision-makers control the US venture capital industry through networks[75]. One of the most obvious ways to broaden one's network with other venture capitalists is to co-invest, in other words, syndicate with them.

Despite the fact that syndication of investments is common practice among venture capitalists, little research has been conducted on it. Lerner suggests that the scarcity of research may be due to the difficulty of analyzing syndication patterns empirically, and to the complexity of motives behind syndication[76].

There are two important types of formal linkages between venture capital firms and their portfolio companies - syndication of investments and seats on the board of directors of those companies. Both formal and informal information flows though these linkages. Formal information is communicated through budgets, financial statements, annual meetings, business plans, etc., whereas informal information is communicated through casual meetings, phone calls, and informal written documents.[77]

Bygrave expects that the frequency of communication between two venture capital firms would depend on the number of portfolio companies, in which they have jointly invested. Hence, the greater the number of syndicated investments, the stronger the ties between the venture capital firms[78]. This assumption seems reasonable since venture capitalists often serve on the boards of their portfolio companies and therefore meet other venture capitalists at least in the board meetings. When Rosenstein et al. studied the board composition of US portfolio companies, they discovered that the typical board comprised 1,7 inside members, 2,3 venture

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[75] Bygrave, W, Timmons, J. 1992. Venture Capital at the Crossroads. *Harvard Business School Press*. Boston. p 185

[76] Lerner, J. 1994. The Syndication of Venture Capital Investments. *Financial Management,* volume 23, No. 3, Autumn 1994. p 16

[77] Bygrave, W. 1987. Syndicated investments by venture capital firms: a network perspective. *Journal of Business Venturing*, volume 2. pp 140-141

[78] Bygrave, W. 1987. Syndicated investments by venture capital firms: a network perspective. *Journal of Business Venturing,* volume 2. p 141

capital principals, 0,3 venture capital staff, and 1,3 other outsiders[79]. These numbers illustrate that venture capitalists are well represented in the boards of their portfolio companies.

In addition to the frequency between a pair of firms, the number of communication links with different venture capital firms can measure the extent of the network. Thus, the greater the number of different venture capital firms with which a firm has syndicated investments, the broader its network, and the greater its influence in the network[80].

4.1. Resource Exchange Model

Bygrave argues that the resource exchange model of Pfeffer and Salancik (1978) is useful in explaining the networks of venture capital firms. It is a theory with three structural variables: 1) concentration, which is the degree to which power is concentrated in the environment; 2) munificence, which is the availability of resources; and 3) interconnectedness, which is the number linkages among organizations. These three variables determine how organizations interact. This interaction is characterized by two variables: 1) conflict and 2) interdependence. Furthermore, conflict and interdependence determine the amount of uncertainty the company confronts.

According to the resource exchange model, a rational organization tries to manipulate structural variables, concentration, munificence, and interconnectedness, in a way that will reduce uncertainty. "When situations of exchange and competition are uncertain and problematic, organizations attempt to establish linkages with elements in their environment and use those linkages to access resources, to stabilize outcomes, and to avert environmental control."[81]

4.1.1. Interconnectedness

According to the resource exchange model, the interconnectedness of a firm is a "function of uncertainty, munificence, and the degree of concentration of its industry"[82] More formally:

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[79] Rosenstein, J, Bruno, A. Bygrave, W, Taylor, N. 1993 The CEO, Venture Capitalists, and the Board. *Journal of Business Venturing,* 8. p 99

[80] Bygrave, W. 1987. Syndicated investments by venture capital firms: a network perspective. *Journal of Business Venturing,* volume 2. pp 140-141

[81] Pfeffer, J; Salancik, G.R. 1978. The External Control of Organizations. Harper & Row. New York

[82] Bygrave,W. 1988. The Structure of the Investment Networks of Venture Capital Firms. *Journal of Business Venturing*, volume3, 2. p 139

interconnectedness = f(uncertainty, munificence, concentration)

Interconnectedness itself measures the degree to which firms within an industry are linked together into a network. Here, I measure the degree of interconnectedness by the number of external syndications a VCF has made.

The resource exchange model predicts that the interconnectedness is greater the more uncertain and the less munificent the industry is. The logic behind is that high uncertainty makes sharing of information to reduce uncertainty more valuable than when the uncertainty is low. When the uncertainty is high, also the marginal benefit from degreasing the level of uncertainty is high, which makes the syndication economically desirable. Moreover, the munificence affects the interconnectedness because firms need to co-operate more when they lack the resources to do business efficiently alone. Finally, the resource exchange model predicts that the interconnectedness is highest in industries with intermediate levels of concentration. For when there are only a few large firms in an industry, there is little need to improve coordination, and when there is a great number of companies in an industry, it is merely impossible to have enough links to improve coordination distinguishably.[83]

4.1.2. Munificence

Munificence is the degree to which the resources, such as capital, customers, and employees, that a venture capital firm needs to gather from its environment, are abundant. The main resources that a venture capital firm needs are capital, a flow of deals, and talented people to manage its investments.

Venture capital firms are constantly raising new capital for new funds from which to invest. The amount of capital raised each year has grown steadily throughout 90's in Finland[84]. According to the resource exchange model, the greater the resources of capital, the greater is the capacity to spread financial risk internally, and the less need to syndicate investments*. Thus,

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[83] Bygrave, W. 1987. Syndicated investments by venture capital firms: a network perspective. *Journal of Business Venturing,* volume 2. p 143

[84] Borg, P. 1998. Ammattimainen pääoma sijoittaminen Suomessa 1997". Finnish Venturing Association ry. p 13

* Because syndication divides the total investment into smaller parts, the investment size is smaller then if the VCF would do it alone.

H6a *Venture capital firms with large capital resources have a lower propensity to syndicate than those venture capital firms with smaller capital resources.*

Bygrave found that the amount of capital under management was unrelated to the proportional amount of co-investing. He believes this finding suggests that sharing of expertise is the predominant factor affecting venture capital firms' syndication decisions. He could not, however, study the relative importance of the spreading of risk within a portfolio, because he lacked data of the amount invested by each venture capital firm in each portfolio company.[85]

A study of joint ventures among the top 20 U.S. oil companies found that the number of joint ventures rose steadily with the size of the oil company. This finding is contradictory to the financial risk-sharing hypothesis, because large firms have less need to share risk than smaller ones do.[86]

In Finland, raising capital does not seem to be the bottleneck for most of the venture capital firms. Only a third of the capital raised has been invested so far[87]. Hence, one could argue that also in Finland, there is too much money chasing too few deals. Because of the high unemployment in Finland in the 90's, finding talented people to manage investments should not have been an impossible task to accomplish. Thus, it seems that in the 90's, the critical resource has been an abundant supply of deals from which to select a new portfolio company. Therefore I hypothesize that:

H6b *Venture capital firms with better availability of prospective investments have a lower degree of connectedness.*

4.1.3. Concentration

The resource exchange model also predicts that the interconnectedness is highest in industries with intermediate levels of concentration. For when there are only a few large firms in an industry, there is little need to improve coordination, and when there is a great number of companies in an industry, it is merely impossible to have enough links to improve

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[85] Bygrave, W. 1987. Syndicated investments by venture capital firms: a network perspective. *Journal of Business Venturing,* volume 2. pp150-151

[86] see Bygrave, W. 1987. Syndicated investments by venture capital firms: a network perspective. *Journal of Business Venturing,* volume 2. p 142 – Herman, E. 1981, "Corporate Control, Corporate Power"

[87] Borg, P. 1998. Ammattimainen pääoma sijoittaminen Suomessa 1997". Finnish Venturing Association ry. pp 13

coordination distinguishably. Coordination is a means of reducing uncertainty in market competition and in sources of supply[88]. Venture capital firms are both competitors and suppliers to each other, for they compete for funds and for prospective deals, yet they also share deals that are syndicated. Thus, it is expected that the venture capital industry will have a relatively high degree of interfirm linkages. My hypotheses relating to the concentration are as follows:

H7a *Venture capital firms within a more concentrated group, measured by capital invested, have a higher degree of propensity to invest among themselves*

H7b *Venture capital firms located nearby have a higher degree of propensity to invest among themselves*

In an extensive study of syndicated investments, which covered 1501 portfolio companies and 464 US venture capital firms, Bygrave found that the top 61 venture capital firms were managing 57% of the total pool of venture capital. He also found that top venture capital firms were geographically concentrated, as 38 of the top 61 companies were located in just three states. Moreover, the top 61 venture capital firms seemed to have substantial influence in the venture capital industry through their extensive networks - they had namely invested in 72,8 percent of all portfolio companies. The top 21 HIVCs (High Innovative Venture Capital Firms) and the top 19 MIVCs (Medium Innovative Venture Capital Firms) combined had invested in 65,9 percent of the HITVs (High Innovative Technological Ventures). Bygrave classified the U.S. venture capital industry as having intermediate concentration at most.[89]

Bygrave found that the top 61 firms did not show significantly greater propensity to co-invest among themselves than with the other 403 venture capital firms.[90] However, California HIVCs had significantly ($p<0,01$) greater propensity to invest among themselves than HIVCs overall. He argues that the higher observed number of co-investments among California HIVCs can be partially explained by the degree of concentration. He discovered that California HIVCs managed 71 percent of the total pool, and argued that this relatively high degree of

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[88] Pfeffer, J; Salancik, G.R. 1978. The External Control of Organizations. Harper & Row. New York.

[89] Bygrave, W. 1987. Syndicated investments by venture capital firms: a network perspective. *Journal of Business Venturing,* volume 2. pp 145-147

[90] Bygrave,W. 1988. The Structure of the Investment Networks of Venture Capital Firms. *Journal of Business Venturing,* volume3, 2. p153

concentration made them aware of competition among themselves and therefore encouraged co-investments.

However, Bygrave did not control for geographic distance. Previous research has shown that high-tech venture capital firms focus on the early stage[91]. In addition, early venture stages are found to require more of a "hands on" involvement from the venture capitalists. This involvement naturally requires proximity[92]. This would partially explain why Californian HIVCs prefer to co-invest among themselves.

4.1.4. Uncertainty

Bygrave measured the uncertainty factor in his study using three variables: technology, venture stage, and industry. Bygrave divided the portfolio companies into high and low innovative technological ventures (HITVs and LITVs) by asking venture capitalists to rate their level of technology used in producing or delivering the product or service, and the technology used in application of the product or service[93].

Because investing in high technology ventures is highly uncertain and requires sophisticated technical knowledge, there would seem to be a clear need to share expertise in order to reduce uncertainty.

Bygrave found that the overall connectedness of US venture capital industry was only 2,3 percent, but among the top 21 high-tech firms, it was already 37 percent, and for the 9 Californian top 21 high-tech firms it was 69 percent. The analysis showed that high-tech venture capital firms are more interconnected than low-tech venture capital firms. This finding is consistent with the resource exchange model, since more uncertainty should imply more interconnectedness.[94] The fact that venture capital firms focusing on high technology ventures syndicate proportionally more, could be explained by the sharing of information to reduce uncertainty, or the sharing of financial risk, or both.

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[91] Elango, B. Fried, V. H. Hisrich, R.D. Polonchek, A. 1995. How Venture Capital Firms Differ. *Journal of Business Venturing*, 10. p 164

[92] Sapienza, H. 1992. When Do Venture Capitalists Add Value?. *Journal of Business Venturing*, 7. p 19

[93] Bygrave, W. 1987. Syndicated investments by venture capital firms: a network perspective. *Journal of Business Venturing*, volume 2. p 145

[94] Bygrave,W. 1988. The Structure of the Investment Networks of Venture Capital Firms. *Journal of Business Venturing*. volume3, 2. pp 143-150

Interestingly, the data shows that the average investment size is significantly smaller for high-tech investments than for low-tech investments, which led Bygrave to conclude that co-investing is driven much more by the need to share expertise than by the need to spread financial risk. For, if it was purely the spreading of financial risk, then the greater the amount of invested per portfolio company, the greater the number of syndicated investments would be, all other things being equal.[95]

Bygrave also studied the uncertainty associated with the venture stage by dividing the portfolio companies into two groups: the early stage and the late stage companies. Similarly to the results regarding technology, Bygrave found that the proportional ratio of syndication was significantly higher in the early stage than in the late stage companies, even though the average total investment size was significantly less for the early stage ventures. Once again Bygrave interpreted these results in favor of information sharing hypothesis by stating that "the principal reason for co-investing was not spreading of financial risk. Rather it was the sharing of expertise."[96].

Finally, Bygrave studied the uncertainty associated with the industry of the portfolio company. He compared the amount of co-investing in computer and consumer products industries. He chose these industries, "because, in general, there is much more product technology and uncertainty in computer than consumer products"[97]. As was expected, the ratio of syndicated investment pairs to single investments in computer companies was almost five times greater than in consumer companies. Yet there was no difference in the total amount of invested per company between the two industries. Bygrave went as far as arguing that the main reason for co-investing is the sharing of expertise.[98] However, the results only reveal that the extra uncertainty associated with high technology ventures or early venture stage overweighs the investment size effect, which pulls to the other direction. Thus, Bygrave's argument is too strong with respect to the results. The results are, indeed, consistent with the portfolio theory.

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[95] Bygrave, W. 1987. Syndicated investments by venture capital firms: a network perspective. *Journal of Business Venturing,* volume 2. pp 148-149

[96] Bygrave, W. 1987. Syndicated investments by venture capital firms: a network perspective. *Journal of Business Venturing,* volume 2. p 151

[97] Bygrave, W. 1987. Syndicated investments by venture capital firms: a network perspective. *Journal of Business Venturing,* volume 2. p 149

[98] Bygrave, W. 1987. Syndicated investments by venture capital firms: a network perspective. *Journal of Business Venturing,* volume 2. pp 149-150

I will measure the degree of venture capital firms' uncertainty by industry and venture-stage index. I assume that those venture capital firms concentrating on early venture stages and on high-tech industries face a greater amount of uncertainty than those focusing on late and low-tech firms do. According to the resource exchange model, I hypothesize:

H8a: *venture capital firms focusing on early stage companies have a higher degree of connectedness than those venture capital firms investing in more mature ventures*

H8b: *venture capital firms focusing on high-tech companies have a higher degree of connectedness than those venture capital firms investing in low-tech ventures*

4.2. CONNECTEDNESS

The connectedness of a network is the percentage of pairs of venture capital firms with one or more actual co-investment to the maximum number of all possible pairs. Thus, for a group with N members, the maximum number of intragroup direct links is N(N-1); for two separate groups with K and L members, the maximum number of intergroup direct links is KL.

Let us now look closer at the formulas that Bygrave used to measure the network of US venture capital firms. Consider two venture capital firms, *i* and *j*, investing in the same subset, *s*, of companies. The number of their joint investments, *y(s)*, is given by the following equation:

$$y_{ij}(s) = a_{ij}(s)x_i p_i(s)x_j p_j(s)\text{, where}$$

Equation 2 The number of joint investments of two venture capital firms

x_i is the number of investments in i's portfolio

$p_i(s)$ is the propensity of *i* to invest in subset s of portfolio companies

a_{ij} is the propensity of venture capital firm *i* to invest jointly with *j* in the subset *s* of companies.

The number of investments in *i*'s portfolio, n_i, is the total capital invested by *i* in its portfolio companies divided by the average amount invested per portfolio company.

4.3. INTRAGROUP SYNDICATION

The total number of co-investments by all pairs within a group of venture capital firms is given by equation 3,

$$Y(s) = \sum_i \sum_j a_{ij}(s) n_i p_i(s) n_j p_j(s)$$

Equation 3 Total number of intragroup syndication

where a_{ij} can be assumed to be the intragroup constant, *A*, that captures the resource exchange model's variables of uncertainty, munificence, and concentration for this homogeneous group of venture capital firms.

4.4. INTERGROUP SYNDICATION

If there are two groups of venture capital firms, *k* and *m*, the total number of co- investments by all intergroup pairs in subset, *s*, of portfolio companies is *Z*(*s*):

$$Z(s) = \sum_k \sum_m b_{km}(s) n_k p_k(s) n_m p_m(s)$$

Equation 4 Total number of intergroup syndication

b_{km} can be assumed to be the intergroup constant, *B*, which captures the resource exchange model's variables of uncertainty, munificence, and concentration for these two different types of groups of venture capital firms.

4.5. STRENGTH OF CONNECTIONS

The connectedness measures only the existence of direct links between different venture capital firms. It ignores the strength of these links, because if two venture capital firms have syndicated even once, a connection exists. In order to take into account the strength of the link, one could measure the number of times that syndication has occurred among the venture capital firms. The number of direct links, also called the number of pairs of investors, can be used as a measure of the strength of the connection. The number of direct links in a portfolio company with N investor is N(N-1)/2. So if a portfolio company has two investors, it has one pair of co-investors; three investors, three pairs; four investors, six pairs; and so on. Obviously, if a company has only one investor, it has no direct links.[99] The total number of direct links can be used as a measure of a given venture capital firm's interconnectedness with its network.

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[99] Bygrave,W. 1988. The Structure of the Investment Networks of Venture Capital Firms. *Journal of Business Venturing,* volume 3, 2. p143

4.6. CENTRALITY

Centrality measures the relative importance in the network. Bygrave uses three different measures to estimate centrality. First measure counts only the connectedness, that is the existence of a direct link. The problem of this measure is, of course, that it gives as much weight to a connection with just one co-investment as with multiple co-investments. The second measure is the intensity, which weights a connection in direct proportion to the number of co-investments. The third and most advanced measure overcomes this problem by scaling the weight from 0 to 1 so, that it approaches 1 asymptotically. Still another possible measure of centrality is the cumulated distance from other members of the network. Aldrich and Whetten define a measure called index of point centrality shown in equation 5, where np(i,j) is the number of points reachable from i and d(i,j) is the distance between points I, and j. Distance is measured by the number of direct links that are required to connect two venture capital firms. Thus, a direct connection has a distance of 1, a connection via two links has a distance of 2, and so on.

$$h(i) = [np(i,j)]^2 - \sum_j d(i,j)$$

Equation 5 Index of point centrality

Bygrave found that the first three measures of centrality give similar results and suggest that network of top 21 HIVCs is hierarchical. However the network seems to be flat in terms of point centrality. Because Bygrave did not have the information of lead investors, normally the originator of the deal, he was unable to measure the directionality of the links. [100]

4.7. REASONS FOR SYNDICATION

Bygrave reported that venture capitalists often prefer to spread risk and information through a network of co-investors[101]. Bygrave has argued that the most important reason for venture capital firms to syndicate is because they want to share information not because they want to share financial risk. This subchapter divides these two main reasons into subreasons and discusses each potential subreason separately.

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[100] Bygrave,W. 1988. The Structure of the Investment Networks of Venture Capital Firms. *Journal of Business Venturing,* volume 3, 2. pp 151-152

[101] Bygrave, W. 1987. Syndicated investments by venture capital firms: a network perspective. *Journal of Business Venturing,* volume 2. p 152

4.7.1. Spreading of Financial Risk

Syndication enables financial risk diversification according to four dimensions. First, syndication enables a venture capital firm to co-invest in different venture stages with other venture capital firms, which might be more experienced in the venture stage in question. Second, syndication enables a venture capital firm to co-invest in different industries with other venture capital firms, which might have expertise in that industry. Third, syndication enables a venture capital firm to diversify across geographic scope, because other venture capitalists can do the monitoring and post-investment activities for the other syndication partners. Finally, syndication enables a venture capital firm to diversify across a greater number of otherwise similar companies, and therefore, to diversify away the company specific risk. For example, instead of investing 10 million in one company a venture capital firm could syndicate and invest 2,5 million in four similar companies in terms of industry, stage and location.

In addition, because venture capital firms usually receive 20 percent of the fund's capital gain but do not share the possible losses, original investors must protect themselves against opportunistic behavior. They usually limit the fund's upper bound investment size, in a way that no more than 10 percent of the fund's capital can be invested in one portfolio company. Occasionally, a promising company could require such a large amount of capital that this limit might inhibit the venture capital firm to invest in it without syndication. Thus, syndication allows VCFs to participate in larger deals than they could invest by themselves. The subreasons relating to spreading of financial risk are summarized below.

H9a: *syndication enables VCFs to invest in a greater number of different venture stages*

H9b: *syndication enables VCFs to invest in a greater number of different industries*

H9c: *syndication enables VCFs to invest in companies within a broader geographic scope*

H9d: *syndication is a means of reducing company specific risk because it allows VCFs to invest in a greater number of similar companies*

H9e: *syndication allows VCFs to participate in larger deals (e.g. fund limits, minority-holding rule).*

4.7.2. Information Sharing

Larson suggests that a key goal of the entrepreneur is to build network exchange structures with outsiders, who are identified as critical resource suppliers[102]. A venture capitalist may provide access to important networks, which a company would otherwise find difficult to penetrate. Access to these networks significantly increases the possibility of successful development because they provide information resources and market outlets for distribution[103]. Thus, venture capital firms may wish to broaden their network of contacts by co-investing and establishing relationships with other venture capital firms.

H10a: *Syndication enables VCFs to build industry specific networks and contacts.*

Robert Drummond, a venture capitalist, says that syndication ensures venture capitalists a large supply of deals or deal flow. He believes that by building a network of like-minded investors, he is less likely to miss a good investment opportunity, because also his partners are looking for investments. However, some venture capitalists want everything for themselves once they think they have found a good investment opportunity. [104] As one common joke among venture capitalists says it "Good deals don't flow".

H10b: *Syndication enables VCFs to obtain future deal flow from the syndicated partners.*

Sah and Stiglitz show in their study that it may be more efficient to undertake only those projects, which are approved by two independent reviewers, instead of undertaking all projects approved by just either one of the reviewers[105]. Therefore, if two venture capitalists can to some degree independently evaluate the business and if they will go forward with the deal only if they both agree that the company is worth of investing. This unanimous decision-making procedure might result in better decisions than they could make on their own.

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[102] Larson, A. 1992. Network Dyads in entrepreneurial settings: A study of the governance of exchange relationship. *Administrative Science Quarterly*, volume 37. p 100

[103] Steier, L, Greenwood, R. 1995. Venture Capitalist relationships in the deal structuring and post investment stage of new firm creation. *Journal of Management Studies*. p 348

[104] Sandtler, D. 1993. How Venture Capitalists Add Value.. *Journal of General Management*, volume 19, 1. pp 3-8

[105] See Lerner. 1994. p 17 - Sah, R.K, Stiglitz, J, E. The Architecture of Economic Systems: Hierarchies and Polyarchies. *American Economic Review*. pp 716-727

H10c: *Two venture capitalists from different venture capital firms can together make a better investment decision than just one.*

Because institutional investors examine the venture organizations' track record, offering documents of investments in successful companies, often not clarifying whether the venture capitalists was an early or late investor, it might be beneficial for a venture capital firm to invest in a promising firm shortly before it goes public, even if the financial return itself is low[106]. Lerner has found that when established venture capital firms join as new investors in later rounds, the portfolio company's valuation has often experienced a sharp increase prior the investment.[107] Thus,

H10d: *VCFs want to be part of success stories, and therefore make later round syndicated investments in well performing companies.*

Since venture capital firms need to raise additional funds to stay in business, marketing and public relations are likely to play an important role in this fund raising process. Thus, venture capital firms may syndicate because

H10e: *Syndication has public relations value and VCFs want their company name to be attached to as many deals as possible.*

Finally, due diligence process as well as monitoring portfolio companies is time consuming. The time spent in due diligence and post-investment activities is likely to be at least partially independent of the size of the investment. It follows that the cost of time is an especially important factor in relatively small size investments. However, if the lead investor can do the due diligence and monitoring for other investors, syndication can reduce the total time put into the venture.

H10f: *Syndication is an efficient way to invest in smaller deals because it reduces the amount of work needed to evaluate the proposal and to assist the company personally.*

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[106] Lerner, J. 1994. The Syndication of Venture Capital Investments. *Financial Management*, volume 23, 3, Autumn 1994. p 18

[107] Lerner, J. 1994. The Syndication of Venture Capital Investments. *Financial Management,* volume 23, 3, Autumn 1994. p 26.

4.7.3. Discussion

If syndication is only to reduce financial risk then we need to ask can the venture capitalist do it more efficiently than what the original investor would. Because original investors have the possibility to invest in different venture capital funds, they are capable of making "homemade" syndication. Only if the institutional investors are not able to replicate the syndications at no greater costs, will VCFs be rewarded from making syndicated investments.

Furthermore, although syndication enables a VCF to diversify its portfolio, it may make portfolio diversification more difficult for an institutional investor. An institutional investor may believe he has diversified his venture capital funds by investing in several different funds. If these funds syndicate often, the end result may be that the institutional investor winds up having his money in only a few portfolio companies. It follows that from the institutional investors' point of view, a more desirable reason for the existence of syndication is likely to be the sharing of information. The sharing of information is likely to increase VCFs' potential to add value in the portfolio company. Hence, I hypothesize

H10: *The most important reason for venture capital firms to syndicate is to share information.*

4.7.4. Related Issues

According to Bygrave (1987 & 1988), venture capitalists will co-invest with such venture capitalists, which are likely to add value to the investment[108]. This argument is easy to make but hard to test empirically. Hence, I will not measure it in my research.

Lerner's[109] results are consistent with Admati and Pfleider's constant equity share hypothesis. The hypothesis states that those venture capitalists, who already own shares of the portfolio company, will maintain the same stake of the company in subsequent financing rounds to avoid the problems arising from asymmetric information[110]. The old investors have an information advantage over the new investors, and have an incentive to over- or understate the proper value of the company. Only when the old investors maintain their current stake of the

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[108] Norton, E, Tenenbaum, B.H. 1993. Specialization versus Diversification as a Venture Capital Investment Strategy. *Journal of Business Venturing,* 8. p435

[109] Lerner, J. 1994. The Syndication of Venture Capital Investments. *Financial Management*, volume 23, 3, Autumn 1994. p 16

[110] Admati, A.R; Pfleiderer, 1994. Robust Financial Contracting and the Role of Venture Capitalists. *Journal of Finance*, June 1994. pp 371-372

company, will they be indifferent to the valuation of the company. Lerner argues that this implies that later-round financing must be syndicated[111]. I cannot see the logic in his argument. I acknowledge that when syndication takes place, it makes sense that the old owners keep their previous share of the company. However, there would seem to be no clear reason why the previous owners could not invest only by themselves in the next financial round. The reason that new investors are joining the portfolio company is likely to be due to venture capitalists investment strategies. For example, as the company grows, VCFs focusing on late venture stages may want to invest in the company. This may provide an exit for the early stage investor.

Lerner found that in the first round, established venture capital firms, measured by age and committed capital, tend to syndicate with one another. Accordingly, small size venture capital firms syndicate with other small size venture capital firms. However, with each subsequent round this pattern becomes less distinct. He also found that less established venture capital firms syndicate in later rounds. The new investors in the later rounds tend to be smaller in term of committed capital, younger, and less experienced, in terms of number of investments, than the previous venture investors. Lerner argues that the results are consistent with the view that syndication allows venture capitalists to obtain information in order to make better investment decisions.[112] Lerner also recognized that financial risk sharing is another important reason for syndication, but he did not in his study examine its influence on syndication[113].

4.7.5. Characteristics of Loosely and Tightly Coupled Networks

Now that we know that the US venture capital industry is loosely coupled* overall, but that the top firms, especially high-tech venture capital firms, are more intensively connected among themselves, we can discuss the benefits and disadvantages from being part of a tightly coupled network.

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[111] Lerner, J. 1994. The Syndication of Venture Capital Investments. *Financial Management*, volume 23, 3, Autumn 1994. p 16

[112] Lerner, J. 1994. The Syndication of Venture Capital Investments. *Financial Management,* volume 23, 3, Autumn 1994. pp 25-26

[113] Lerner, J. 1994. The Syndication of Venture Capital Investments. *Financial Management*, volume 23, 3, Autumn 1994. p18

* loosely coupled network means that the connectedness of the network is low

In a tightly coupled system, external influence can affect the entire system because information flows quickly through many channels. Members of the tightly coupled system may have uniform behavior. It may be very difficult for an entrepreneur to receive financing, if one of the network members has turned his proposal down. For example, the chances of obtaining other venture capital for companies, from which previous venture capitalists had denied follow-on financing, reduced by 74 percent.[114]

A loosely coupled system has the disadvantage of slow communication, but can bring new information to the system. To ensure fresh information to the network, top firms syndicate also with outside members. Another advantage of the loosely coupled system is the diversification effect. Industry and life-stage diversification moderates the ups and downs of the whole industry.[115]

Aside from that syndication may make portfolio diversification more difficult from an institutional investor's perspective, all other issues of syndication have been positive. There are, however, some potential pitfalls in syndication, which I briefly mention in the next paragraph.

Steier et al. found out in a case study, that syndication could result in delays in later stage financing due to bureaucracy in the decision-making procedures. Each of the original investors was involved at each stage and had to make decisions on how much to invest. This naturally requires information collection and assessment, which in turn is time-consuming. The company ended up getting the money later than planned, because when one investor was behind the schedule it delayed the whole project.[116]

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[114] Bruno, A, V, Tyebjee, T, T. 1983. The One that Got away: A Study of Ventures Rejected by Venture Capitalists. *Frontiers of Entrepreneurship Research*. Babson College. p 289

[115] Bygrave, W, Timmons, J. 1992. Venture Capital at the Crossroads. Harvard Business School Press. Boston.p. 192

[116] Steier, L, Greenwood, R. 1995. Venture Capitalist relationships in the deal structuring and post investment stage of new firm creation. *Journal of Management Studies*. pp 345-347

5. INITIAL MODEL

This chapter briefly summarizes the hypotheses presented in the previous chapters and introduces the initial model.

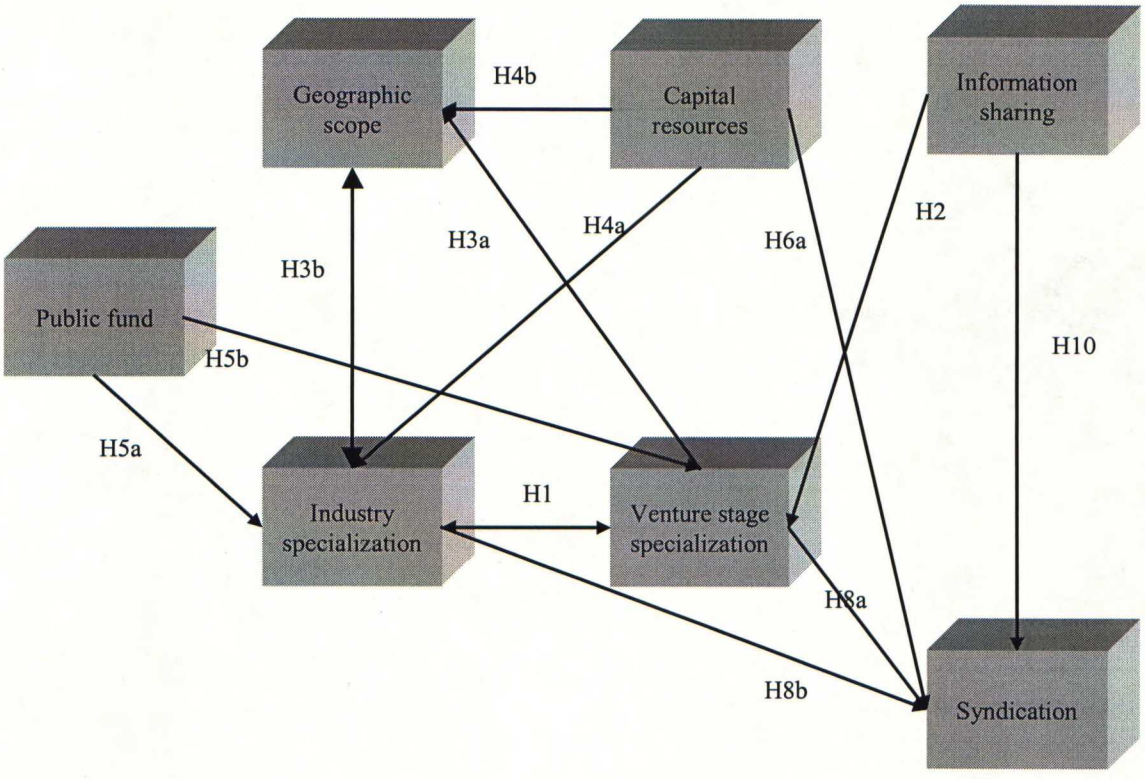

Figure 7 Initial model

H1a: *Venture capital firms that invest mainly in early stage ventures will prefer investment opportunities within a more diverse set of industries than other venture capital firms.*

H1b: *Venture capital firms that invest mainly in early stage ventures will prefer investment opportunities within a less diverse set of industries than other venture capital firms.*

H2a: *Venture capitalists seek to control unsystematic liquidity risk will lead them to diversify across several different venture stages.*

H2b: *The venture capitalists' strategy to specialize in order to enhance their position in networks and information sharing flows will lead them to concentrate in one financing stage or several financing stages, which may be related by virtue of subsequent follow-on investments.*

H3a: *Venture capital firms that invest mainly in early stage ventures will prefer investment opportunities within a narrower geographic scope than other venture capital firms.*

H3b: *Venture capital firms that invest within a less diverse set of industries will look for investment opportunities within a broader geographic scope than other venture capital firms*

H4a: *Venture capital firm with a larger pool of capital under management will prefer venture investments within a more diverse set of industries than other venture capital firms.*

H4b: *Venture capital firm with a larger pool of capital under management will prefer venture investments within a broader geographic scope than other venture capital firms.*

H5a: *Venture capital firm with public sources of funds will prefer a less diverse set of industries (focusing on high-tech industries) than other venture capital firms.*

H5b: *Venture capital firm with public sources of funds will prefer more early stage ventures than other venture capital firms.*

H6a *Venture capital firms with more resources of capital have a lower degree of connectedness than those venture capital firms with smaller capital resources.*

H6b *Venture capital firms with better availability of prospective investments have a lower degree of connectedness.*

H7a *Venture capital firms within a more concentrated group, measured by capital invested, have a higher degree of propensity to invest among themselves.*

H7b *Venture capital firms located in Helsinki have a higher degree of propensity to invest among themselves.*

H8a: *Venture capital firms focusing on early stage companies have a higher degree of connectedness than those venture capital firms investing in more mature ventures.*

H8b: *Venture capital firms focusing on high-tech companies have a higher degree of connectedness than those venture capital firms that invest in low-tech ventures.*

H10: *The most important reason for venture capital firms to syndicate is to share information.*

6. DATA AND METHODOLOGY

This chapter presents the methodology and descriptive analysis of both Finnish and Israeli samples. The descriptive analysis is presented in parallel for the two sample countries in order to make the comparison easier to follow.

6.1. DATA FROM FINNISH AND ISRAELI VENTURE CAPITAL FIRMS' INVESTMENT PREFERENCES

The study sample from Finnish venture capital firm investment preferences was drawn from the Finnish Venture Capital Association's booklet 1998[117]. Similarly, the Israeli data was obtained from the Israel Venture Association's yearbook 1998[118]. The sample therefore represents well the whole venture capital industry in both countries. In Finland, the investment preferences were given for each venture capital firm, whereas in Israel, the investment preferences were given for each fund. This has to be kept in mind when interpreting direct comparisons of the results. Notice also that from this point on I will use the term VCF to represent an Israeli venture capital fund as well as a Finnish venture capital firm.

The two samples are compared using the two sample median test with Yates' continuity correction. Another possible test would have been the mean test. The non-parametric median test was chosen because it is more robust in situation where the normality assumption might be violated.[119]

6.1.1. Variable Operationalization

This chapter presents the operationalization of the variables.

There are 30 VCFs in Finland, from which 11 are public-related and 19 are privately owned. In Israel, however, the vast majority of VCFs is private and only a few are public-related. Therefore, I will only use the ownership type as a variable for the Finnish data. I coded the variable *type of the VCF* as follows: public=0; private=1

Preferences regarding venture stage diversification is measured by the number of different venture stages. In Finland, there are five different possible venture stages defined as *seed,*

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[117] Finnish Venture Capital Association, 1998. Directory of members 1998. pp 1-56

[118] Israel Venture Association. "IVA 1998 Yearbook". 1998. Edited by Giza Group.

[119] Ghauri, P, Gronhaug, K, Kristianlund, I. 1995 Research Methods in Business Studies. Prentice Hall. New York. pp 106-108

start-up, expansion, buy-outs, and turnaround. The venture stages in Israel were defined as *incubation, seed, start-up, other early-stage, expansion/development, and mezzanine/bridge**. It follows, that the variable *preferred stage diversification* varies between 1 and 5 for the Finnish sample and between 1 and 6 for the Israeli sample. As can be seen from Figure 8, the extent of preferred venture stage diversification seems to be quite similar in both countries – most of the VCFs are looking for investing in two to four different venture stages. However, Finnish VCFs seem to be a little less diversified across venture stages, but the median Chi-square test reveals that the difference is insignificant (p=0,189).

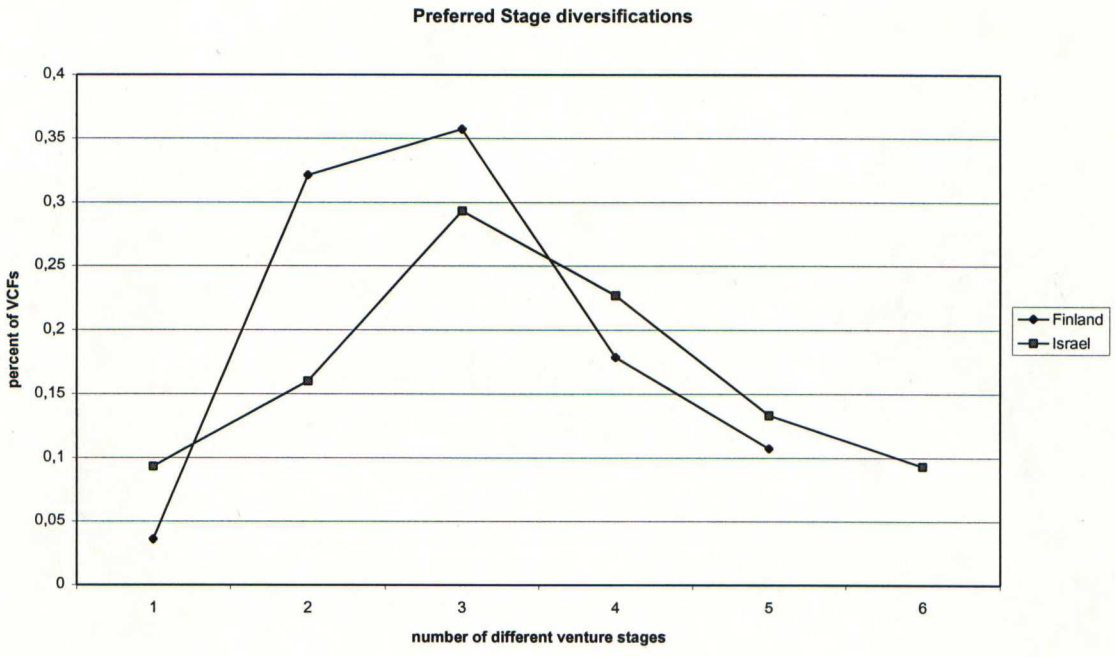

Figure 8 Comparison of the preferred venture stage diversification of venture capital firms across the two samples

To measure whether a VCF is looking for investing in an early or late stage venture, I needed to calculate a variable that would measure the preferred venture stage of the company. I call this variable the *preferred stage index*. Because the VCFs only list the preferred venture stages, I decided to give equal weight to each stage. For the Finnish sample, I calculated the variable *preferred stage index* as the sum of venture stages divided by the number of different

* At the beginning, there was also a stage called "secondary investments in venture capital funds", which I eliminated from the data because I was unable to determine this secondary fund, and therefore, also the venture stage. For example, if the fund in which secondary investment is placed would focus on the same venture stages as the original fund itself, the secondary investment would not affect venture stage diversification. It should be noted that this elimination does not affect the reliability of the data, since there were only three VCFs in Finland and one in Israel that stated making such investments.

venture stages, where the stages were given the following coding: seed=0; start-up=1; expansion=2; MBO=3 bridge=4; turnaround=4. Similarly, I calculated the corresponding variable for Israel, where the venture stages were given the following coding: incubation=0; seed=0; start-up=1; other early-stage=2; expansion/development =3; mezzanine/bridge=4. As a result, both variables vary between 0 and 4. As the Figure 9 suggests, Israeli venture capital funds are quite evenly spread across the spectrum, 17 funds (23 percent) having a venture stage index between 0,5 and 1, that is, seed and start up. In contrast, Finnish VCFs seem to be highly concentrated on venture stages between 2 and 2,5, that is, expansion and buy-outs. However, the median Chi-square test reveals no significant difference in the preferred venture stage index between the countries (p=0,795).

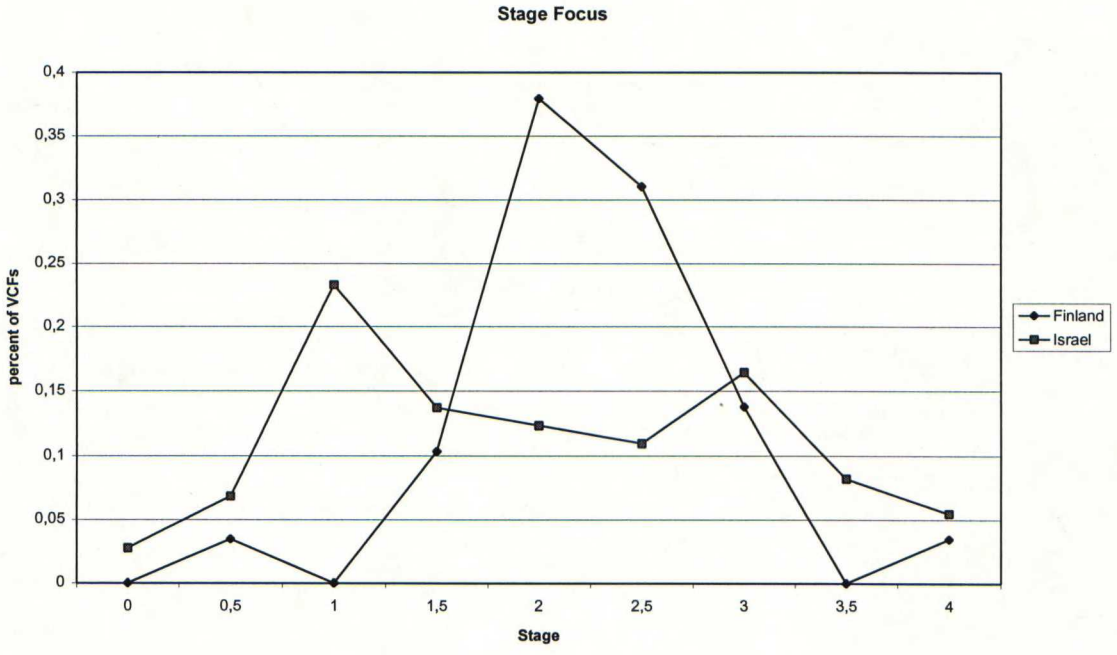

Figure 9 Comparison of the venture stage index of venture capital firms across the two samples

To measure the extent to which a VCF is willing to diversify its investments across industries, I used a similar measure to that of preferred stage diversification. I simply counted the number of industries in which a VCF stated it preferred to invest. A similar measure was used in Gupta and Sapienza (1992). If the VCF stated that it had no industry preference, a number 18 was given. Thus, the variable *preferred industry diversification* varies between 1 and 18 in both samples. As can be seen from Figure 10, 22 out of the 30 (73,3%) Finnish VCFs reported no industry preference, whereas the corresponding number in Israel is only 24,3%. Indeed,

median Chi-square test reveals that Israeli VC funds prefer significantly less industry diversification than their Finnish counter-partners do (p=0,017).

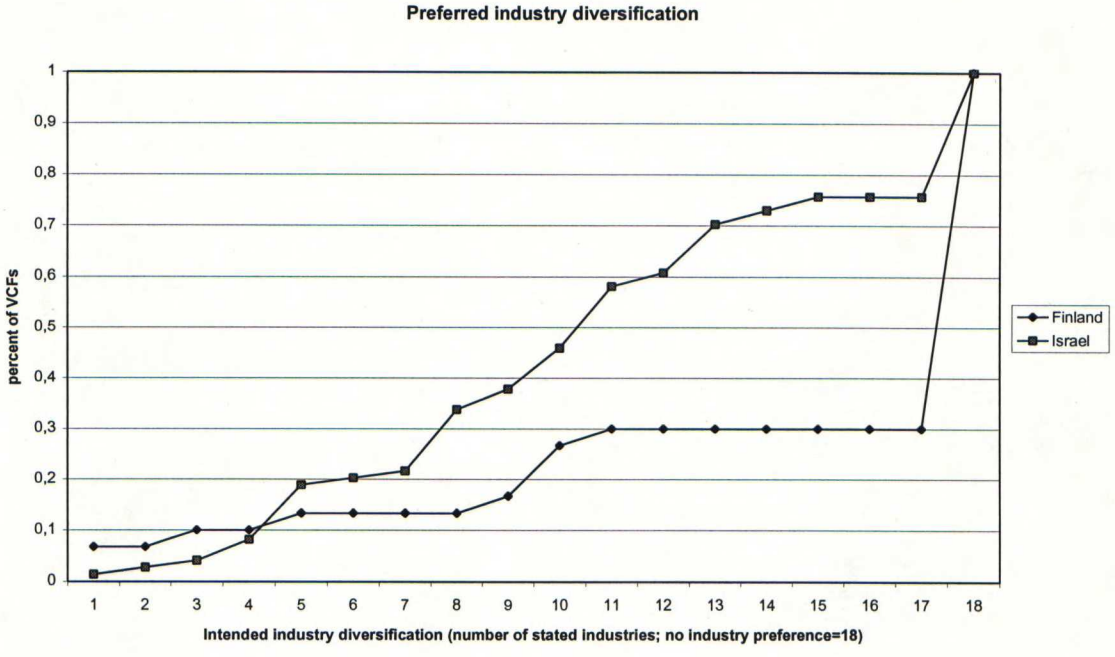

Figure 10 Comparison of the preferred industry diversification of venture capital firms across the two samples

VCFs also stated their preferences concerning the geographic scope, from where they are looking for portfolio investments. The variable *preferred geographic scope*, which measures the preferences regarding the portfolio company's location was coded for the Finnish sample as follows: local=0; national=1; Nordic/Baltic=2; EU/Eastern Europe=3; Asia/US=4. Similarly, Israeli venture capital funds stated their geographic preferences. However, no fund stated that it preferred local investments only – 'Israel only' being the narrowest scope. This is probably because there was not an alternative for such a preference in the list. The variable *preferred geographic scope* is coded for the Israeli sample as follows: Israel only=1; Israel and Israel related=2; Israel and other geographical locations=3; Japan/Taiwan/US=4. Thus, the Finnish variable varies between 0 and 4, whereas the Israeli variable varies only between 1 and 4. As a result, a direct comparison of the preferred geographic scope is not adequate. In Finland there seems to be a clear trend in which the number of VCFs decreases as the geographic scope increases. In Israel, the vast majority of venture capital funds prefer to invest in Israel or Israeli related companies. I did not use statistical measures to compare the two samples because of the difference in coding the variables.

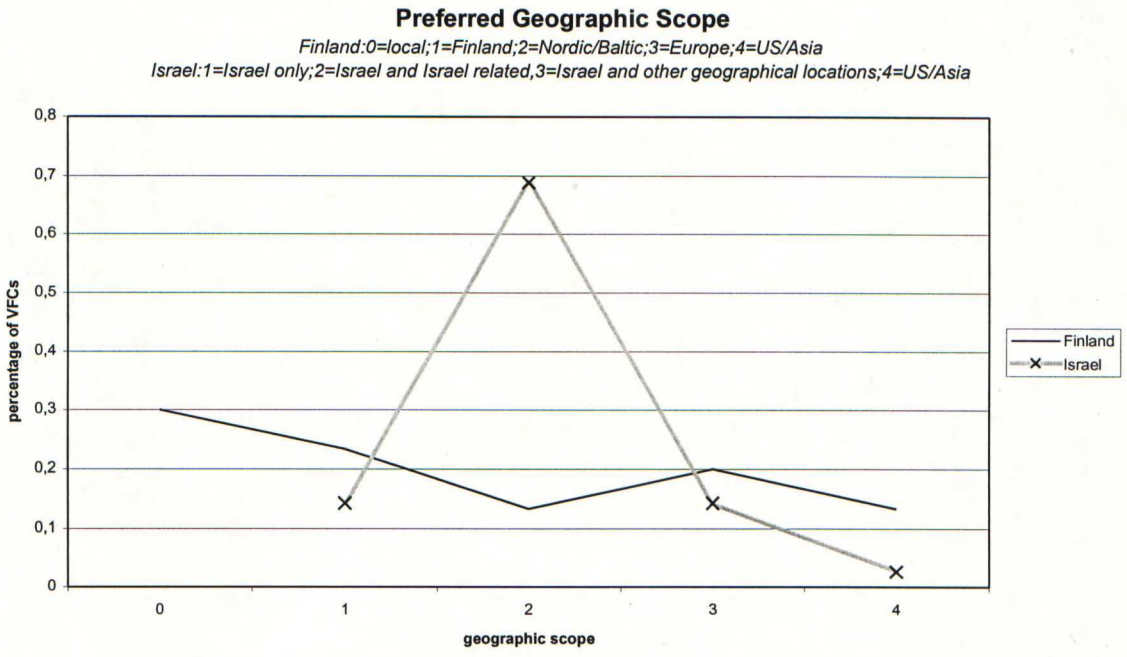

Figure 11 Comparison of the preferred geographic diversification of venture capital firms across the two samples

In addition to the information above, there are some straightforward variables, which are briefly listed below:

- *age of the venture capital fund* is the months since fund's establishment.
- *capital available for investments* equals the difference between the amount of fund capital and the amount of capital invested
- *capital under management* is the VCF's capital under management. Israeli VCFs reported all investment in US Dollars, which were changed to FIM by multiplying by 5.
- *number of employees in the VCF*
- *number of portfolio companies in the fund*
- *Amount of Fund capital* is the amount of capital of the Israeli VC funds (millions of FIM)
- *preferred maximum investment*
- *preferred minimum investment*
- *number of portfolio companies in the VCF*. Notice that the number of portfolio companies the VCF manages is always less or equal to the sum of portfolio companies in its funds, because the VCF may have made internal syndications.
- *typical investment size* reported by the Finnish VCFs

Table 1 shows the descriptive statistics from the Finnish venture capital industry. Corresponding statistics from Israel are presented in Table 2.

Table 1 Descriptive statistics of the Finnish VCF sample

	Valid N	Missing	Mean	Median	Std. Deviation	Minimum	Maximum
Amount of average investment (millions FIM)	28	2	31,60	3	74,72	0,3	375
Capital under management (millions FIM)	28	2	630,65	142,5	1232,36	9,426	6000
Number of employees in the VCF	29	1	8,31	4	10,17	1	45
Preferred stage index	28	2	2,16	2	0,59	0,5	3
Preferred geographic scope	30	0	1,63	1	1,45	0	4
Preferred industry diversification	30	0	14,60	18	5,72	1	18
Amount of capital invested (millions FIM)	24	6	270,71	55	614,42	2,8	3000
Preferred stage diversification	28	2	3,00	3	1,05	1	5
Type of VCF	30	0	0,63	1	0,49	0	1
Amount of minimum investment (millions FIM)	25	5	9,46	1	30,06	0,09	150

Table 2 Descriptive statistics of the Israeli VCF and venture capital fund sample

	N Valid	N Missing	Mean	Median	Std. Deviation	Minimum	Maximum
Amount of capital available (millions FIM)	40	43	103,43	67,5	126,12	0	500
Amount of capital under management (millions FIM)	54	29	225,09	125	251,05	20	1375
Age of the fund (months)	69	14	40,80	39,6	30,11	5,1	147
Amount of fund capital (millions FIM)	73	10	177,10	110	216,82	17,5	1375
Number of portfolio companies in the fund	54	29	12,13	9	9,93	2	48
Preferred geographic scope	77	6	2,05	2	0,63	1	4
Preferred industry diversification	74	9	11,16	11	4,94	1	18
Amount of maximum investment (millions FIM)	55	28	15,45	10	12,21	2,5	55
Amount of minimum investment(millions FIM)	54	29	2,44	2,5	1,92	0	10
Preferred stage diversification	75	8	3,43	3	1,41	1	6
Preferred stage index	73	10	1,90	2	1,07	0	4
Number of portfolio companies the VCF has in its portfolio	47	36	13,81	11	10,57	3	48
Number of employees in the VCF	48	35	4,73	4	2,30	2	13

6.2. Data from Finnish and Israeli Portfolio Investments

This chapter presents the descriptive statistics of the data from actual portfolio investments. Variable operationalization is also presented. From Finland, I have the following information on every investment in the VCFs' portfolio by the end of years 1994, 1995, 1996, and 1997:

- name of the venture capital fund,
- name of the portfolio company,
- ownership percentage of the portfolio company,

- industry in which the portfolio company operates,
- state in which the portfolio company is located in Finland, or if it is located abroad,
- year when the fund initially invested in the portfolio company,
- number of employees in the portfolio company, and
- sales of the portfolio company.

From Israel I have unfortunately less data. I have only the names of the portfolio companies and their industries for every venture capital fund. The portfolio investments are taken from spring 1998.

Matching names of the portfolio companies in which at least two different VCFs have invested, reveals the external syndications. Similarly, matching the portfolio company names in which at least two separate funds managed by the same VCF have invested, reveals the internal syndications. The information of the initial investment year enables me to find out later-round syndications in Finland. Appendix 2 present the matrix, which contains the number of direct links between the Israeli venture capital firms. The corresponding Finnish matrix is confidential.

6.2.1. Variable Operationalization

Actual number of portfolio companies is the number of different portfolio companies in which the Finnish VCF has invested. In Israel, the variable represents the number of different portfolio companies in which an Israeli venture capital fund has invested. It should be noted that this measure differs from the number of investments, since an internal syndication accounts for a multiple investment but for only one different portfolio company. There was no significant difference between the countries in the number of portfolio companies held by venture capital firms (p=0,797). Figure 12 shows the distribution of the actual number of portfolio companies in the sample countries.

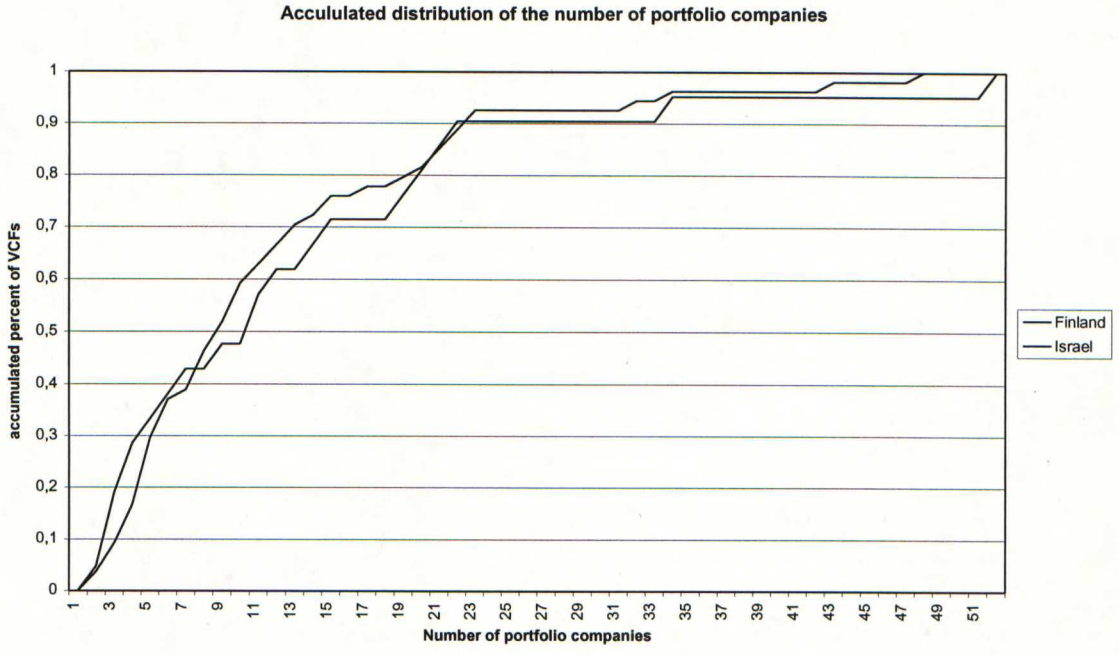

Figure 12 Comparison the number of portfolio companies managed by the VCFs across the two samples

To measure actual investment diversification, I could have used the variable *number of different industries*, which simply counts the number of different industries in which the VCF has investments. The advantage of this measure would have been its good comparability with the *preferred industry diversification* variable, since both would have been calculated the same way.

However, because there are many VCFs that have so far placed only a few investments, and because the number of portfolio companies restricts the number of possible industries, the variable *number of different industries* is likely to lack explanatory power. This can be seen from the high correlation between the *number of different industries* and the actual number of portfolio companies (Finland 0,825; p=0,000; Israel 0,713; p=0,000).

The variable *number of different industries* does not take into account the relative number of portfolio companies in different industries. For example, a VCF having 20 investment in one industry and one investment in five other industries, would receive the same measure as another VCF, which has five investments in each of its six industries. Clearly, the first VCF is more industry-focused.

One way to overcome this problem is to give weight to the industries according to the number of portfolio companies in each industry. Because no information on investment sizes was

available, I made the assumption that the investments are of equal size, and simply gave weights to the industries according to the number of investments. The variable, *industry HHI,* is the Herfindahl-Hirschman index, which measures the industry diversification, and is calculated as follows:

Equation 6 Industry Herfindahl-Hirschman Index

$$HHI = \sqrt{\sum_{i=1}^{n} C_i^2}$$ *, where Ci is the percent of portfolio companies in industry i and n is the number of industries.*

In this study, the variable *industry HHI* is used as the measure of actual industry diversification. Because there are 21 industries used by the Finnish Venture Capital Association, the HHI could, in theory, vary between 21,8 and 100 in Finland. Similarly, because there are 18 industries used by the Israeli Venture Association, the HHI could, in theory, vary between 23,6 and 100 in Israel. Figure 13 illustrates the distribution of actual industry diversification. There is not a significant difference between the countries in terms of actual industry diversification (p=0,797). In order to take into account the restriction the number of portfolio companies poses on industry diversification, I chose to eliminate those VCFs, which had made only one portfolio investment. As a result, two VCFs were eliminated from the Finnish sample and one from the Israeli sample.

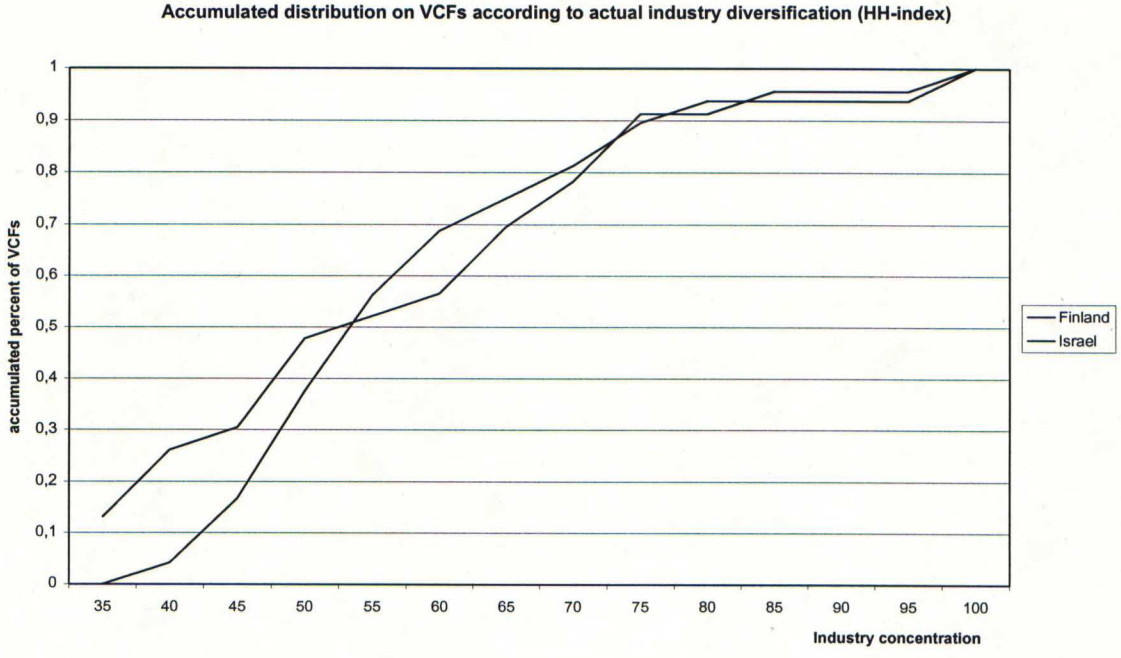

Figure 13 Comparison of industry diversification HH-index across the two samples

To measure the degree of investment in high-tech industries by a VCF, I calculated the variable, *percent of high-tech companies*, which is the percent of portfolio companies operating in the following industries:

> communications, biotechnology, computer-related industry, other electronics-related industry, medical/health-related industry, or industrial automation, and software

Figure 14 presents the general distribution of invested capital by industries in US, Finland, Israel and Europe. The Israeli venture capital industry seems to be technology-oriented compared to Europe and Finland. The ratio of capital invested in high-tech in Israel, is three times that in Finland. A median Chi-square test reveals that Israeli venture capital funds have, indeed, made significantly more investments in high-tech industries than Finnish VCFs (p=0,000).

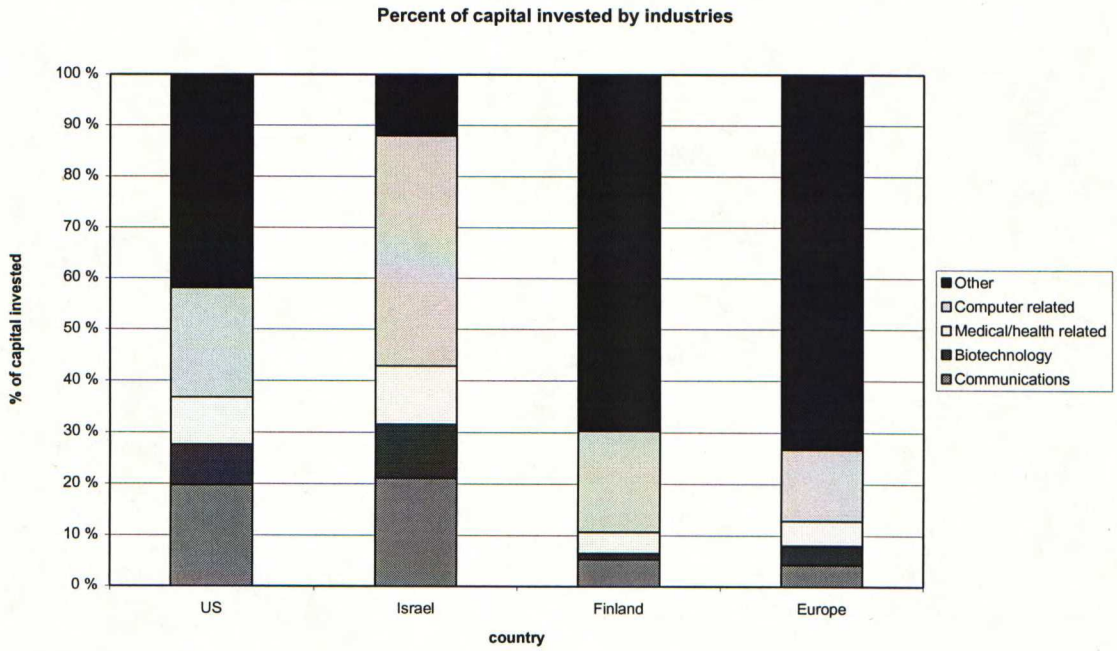

Figure 14 Comparison of the percent of capital invested in some high-tech industries in US, Israel, Finland, and Europe.

Source: Money Tree Survey, IVA yearbook 1998, and Pääomasijoittaminen Suomessa 1997, Coopers & Lybrand, The Economic Impact of Venture Capital in Europe

The absolute number of co-investing by a firm is likely to depend on its size - in other words - the larger the firm, the more investments it has made, and the more syndications it has. Hence, it is important to measure the degree of co-investing of one VCF relative to another firm, in a way that eliminates the size effect. The variable *propensity to syndicate* measures the VCF's

propensity to syndicate and is calculated by dividing the total number of external syndication investments by the total number of investments. Hence, it can be thought of as a probability of an investment being syndicated. Figure 15 shows the ratio of externally and internally syndicated investments, sole investments, and the sum of direct links in Israel and in Finland. These ratios are calculated by dividing the corresponding number by the number of VCFs' investments*. Median Chi-square test shows that Israeli VC funds have a significantly higher propensity to syndicate than Finnish VCFs (p=0,000). It should be noted that the reason there appears to be no later-round syndications in Israel is not because there are no such investments, but because I was unable to obtain such information.

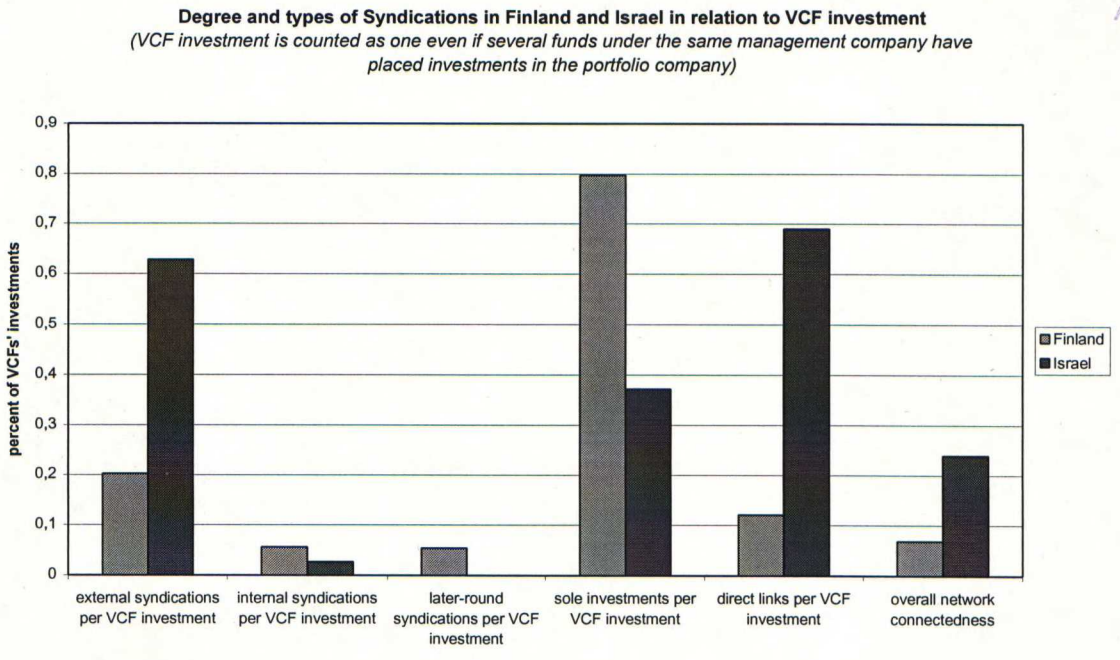

Figure 15 Comparison of the percentages of external syndication, internal syndication, later-round syndication, sole investments, and direct links of VCF across the two samples

Figure 16 shows the distribution of the number of syndication partners in Finland and in Israel. In almost all cases, Finnish VCFs have syndicated with only one other VCF, whereas syndication involving several parties is common in Israel. The average number of partners involved in syndication is in Israel 2,9 and in Finland 2,1.

* It should be noted that the number of investment differs from VCFs' investments because investments by different funds under same management company are counted as one VCF investment.

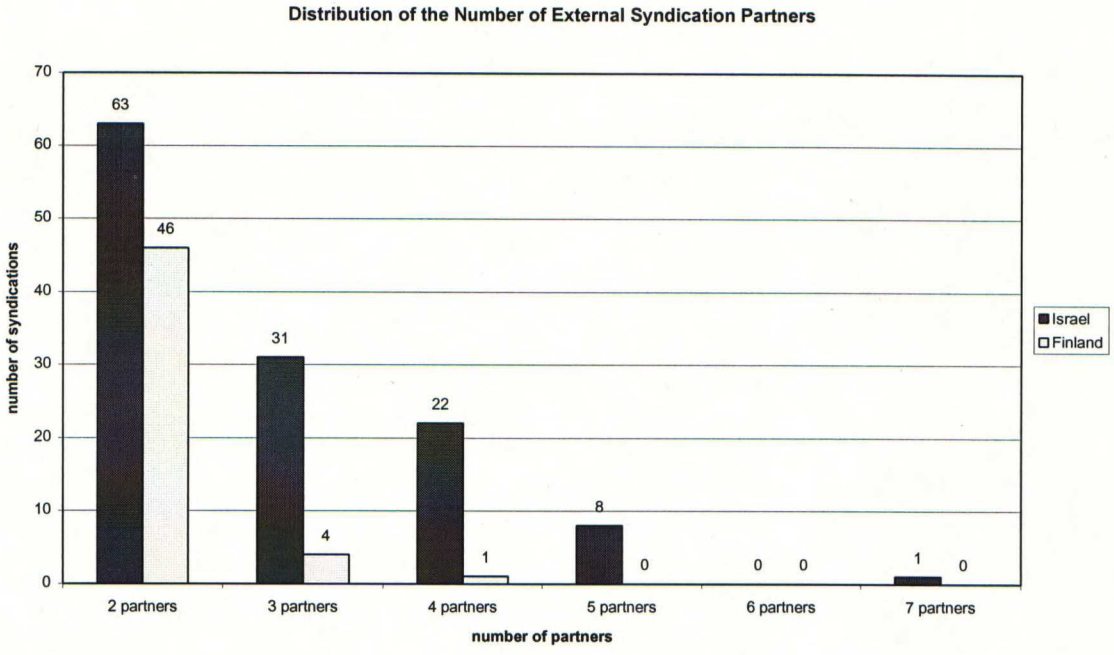

Figure 16 Comparison of the number of syndication partners across the two samples

6.2.2. Descriptive Statistics of the Venture Capital Firms' Portfolio Investments

Table 3 shows the descriptive statistics from the Finnish venture capital industry. Corresponding statistics from Israel are presented in Table 4.

Table 3 Descriptive statistics of the Finnish portfolio investment data

	N Valid	Mean	Median	Std. Deviation	Minimum	Maximum
Number of portfolio companies in the VCF	22	16,82	11,00	20,74	2,00	93,00
Number of different industries in which the VCF has invested	22	6,45	5,50	4,23	2,00	14,00
Industry HHI	22	53,63	51,37	15,20	31,49	83,81
Percent of high-tech companies in the VCF	22	40,60	33,33	25,91	0,00	100,00
Propensity to syndicate	22	0,22	0,12	0,29	0,00	1,00

Table 4 Descriptive statistics of the Israeli portfolio investment data

	N Valid	Mean	Median	Std. Deviation	Minimum	Maximum
Number of portfolio companies in the fund	48	12,02	9,00	10,11	2,00	49,00
Number of different industries in which the fund has invested	48	4,69	4,00	2,12	1,00	11,00
Industry HHI	48	57,08	54,07	13,59	38,67	100,00
Percent of high-tech companies in the fund	48	88,57	96,66	19,87	0,00	100,00
Propensity to syndicate	48	0,58	0,61	0,28	0,00	1,00

6.2.3. Portfolio Investment Level Variables

This subchapter discusses first the opetarionalization of the variables associated with portfolio investment data. It also presents the descriptive statistics of the data of both countries.

External syndication is coded 1 if the investment is syndicated with another VCF, otherwise it is 0.

Internal syndication is coded 1 if the investment is syndicated among another fund within the management company, otherwise it is 0. It should be noted that one portfolio investment can be, and quite often is, both externally and internally syndicated.

A *High-tech company* is coded 1 if the company operates in one of the high-tech industries mentioned in the previous chapter.

Portfolio company's proximity to VCFs office is coded 0, when the portfolio company is located in the same Finnish state as the VCF. Portfolio company's proximity to VCFs office equals 1 if the portfolio company is located in another Finnish state than the VCF's office. In case the portfolio company is located outside Finland, the variable is given a value of 2. This variable could only be calculated for the Finnish sample.

Type of VCF is coded in the same way as previously (public=0;private=1) and is calculated only for the Finnish sample.

Table 5 Descriptive statistics of the Finnish portfolio investment data

Finland	N Valid	N Missing	Mean	Median	Std. Deviation	Minimum	Maximum
Year of data	406	0	1997,07	1997,00	0,25	1997	1998
Number of employees in the portfolio company	365	41	97,20	15,00	341,30	1	2900
External syndication	406	0	0,24	0,00	0,43	0	1
High-tech company	406	0	0,45	0,00	0,50	0	1
Initial investment year	403	3	1995,19	1996,00	2,24	1986	1998
Internal syndication	406	0	0,15	0,00	0,35	0	1
Portfolio company's proximity to VCFs office	406	0	0,48	0,00	0,58	0	2
Later round syndication	406	0	0,07	0,00	0,25	0	1
Percent of ownership	322	84	27,10	25,00	15,72	1	100
Annual sales (millions FIM)	371	35	81,85	9,00	363,68	0	6320
Type of VCF	406	0	0,42	0,00	0,49	0	1

External syndication is coded 1=external syndication 0=not externally syndicated. Internal syndication is coded 1 if the investment is syndicated among another fund within the management company, otherwise it is 0. A High-tech company is coded 1 if the company operates in one of the high-tech industries, otherwise 0. Portfolio company's proximity to VCFs office is coded (0= same Finnish state;1= another Finnish state 2= outside Finland. Type of VCF is coded (public=0;private=1).

Table 6 Descriptive statistics of the Israeli portfolio investment data

Israel	N	Minimum	Maximum	Mean	Std. Deviation
	Statistic	Statistic	Statistic	Statistic	Statistic
High-tech company	578	0	1	0,9135	0,2814
Internal syndication	580	0	1	5,172E-02	0,2217
External syndication	580	0	1	0,6276	0,4839

External syndication is coded 1=external syndication 0=not externally syndicated. Internal syndication is coded 1 if the investment is syndicated among another fund within the management company, otherwise it is 0. A High-tech company is coded 1 if the company operates in one of the high-tech industries, otherwise 0.

6.2.4. Research methods

To further analyze whether the dominant reason to syndicate has to do with spreading of financial risk or with information sharing, I will use the data from the questionnaire shown in appendix 1. This is a new methodological approach to gain information on the reasons for syndication. Asking venture capitalists directly for the motives for syndication, allows me to study factors that would be hard to measure empirically. In addition, I can validate venture capitalists' arguments for syndication by measuring how industry, company, venture stage, and geographic diversification affects syndication patterns according to the actual portfolio investment data.

6.3. QUESTIONNAIRE

All 30 members of the Finnish Venture Capital Association were sent a questionnaire shown in appendix 1. The same questionnaire was sent to 40 Israeli VCFs that were classified either as a private equity company, or a VCF. The questionnaire was not translated into Finnish to avoid methodological problems with translations. Annareetta Lumme, a venture capitalist, who has published articles on venture capital, reviewed the questionnaire. The questionnaire was sent to one respondent in every firm – most often to the president.

The questionnaire was accompanied by a letter that briefly explained the purpose of the study and ensured the confidentiality of the information provided. The respondents were promised a summary of the results as an incentive to fill in the questionnaire. In Finland, the questionnaire was sent a second time to the non-respondents and a follow-up telephone call was carried out to remind non-respondents. Unfortunately, no follow-up procedure was done in Israel due to the project's time and capital constraints.

From Finland, the total response rate was 73% (22/30) and from Israel 28% (11/40). The Finnish response rate is especially high, because out of the eight non-respondents two are

foreign VCFs, which operate only on low scale in Finland (Euroventures, Industri Kapital). Two other funds reported that their investment behavior is on most part not venture capital, and wanted to stay out of the study (Suomen Teollisuussijoitus Oy, Norvestia Oy). Moreover, one fund is not investing anymore (Sadepo Oy). It follows that only three suitable Finnish venture capital firms did not reply to the questionnaire. Hence, the respondents represent well the overall Finnish venture capital industry. Unfortunately, the same argument does not apply to Israel. In addition, quite many of the replies were not completely filled, which resulted in missing data.

7. RESULTS AND DISCUSSION

7.1. SPECIALIZATION VERSUS DIVERSIFICATION

This chapter deepens the analysis of the empirical data. First, the results of testing the hypotheses regarding VCFs' portfolio diversification are presented. The chapter ends with a regression analysis and a discussion of the results.

7.1.1. Results Relating to the Circular Model of Diversification

Figure 17 presents the expected relationships of the circular model of diversification. All four measures are expected to be interdependent. The signs next to the arrows indicate the expected positive or negative relationship between the variables.

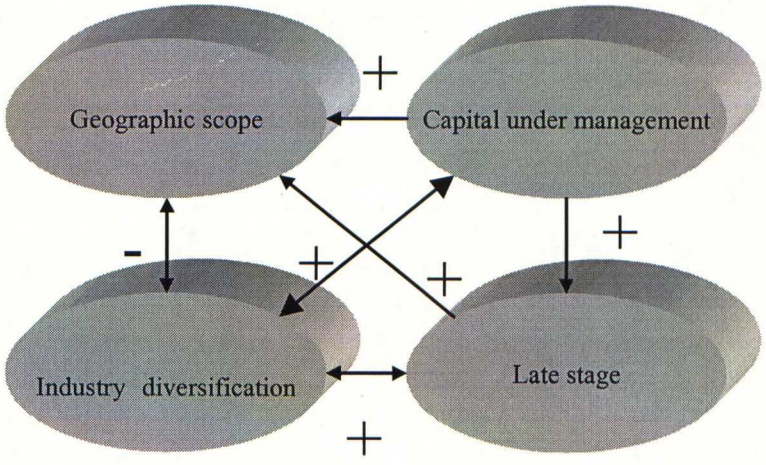

Figure 17 Circular model of diversification

The two tables in Appendix 3 summarize the tau-b correlation coefficients between the variables relating to the circular model of diversification for the two sample countries. Both tables suggest that the variables of the model are, indeed, interdependent. In order to separate the true effects of the variables on each other, I will use partial correlation analysis, which allows me to control for the other two variables[120]. These partial correlation coefficients are presented in Table 7 and in Table 8.

[120] Ghauri, P, Gronhaug, K, Kristianlund, I. 1995 Research Methods in Business Studies. Prentice Hall. New York. p 37

Table 7 Partial correlation coefficients between the construct relating to diversification for the Finnish sample

Finland	Capital under management	Preferred stage index	Preferred geographic scop
Preferred stage index	,3550		
	sig ,074		
Preferred geographic scope	,6651**	-,3049	
	sig ,001	sig ,109	
Industry HHI	-,5434**	,6207**	,4838*
	sig ,010	sig ,003	sig ,021
Preferred industry diversification	,2423	-,2636	-,1336
	sig ,127	sig ,107	sig ,267

Controlled for capital under management, preferred geographic scope, preferred stage index, and industry HHI

Table 8 Partial correlation coefficients between the construct relating to diversification for the Israeli sample

Israel	Amount of fund capital	Preferred stage index	Preferred geographic scope
Preferred stage index	0,2092		
	sig. ,053		
Preferred geographic scope	0,2699*	-,0305	
	sig. ,018	sig. ,408	
Industry HHI	-0,2638	-0,2874	,2543
	sig. ,069	sig. ,052	sig. ,077
Preferred industry diversification	0,0916	,4840**	-,1906
	sig. ,241	sig. ,000	sig. ,071

Controlled for the amount of fund capital, Preferred geographic scope, preferred stage index, and preferred industry diversification[*]

7.1.2. Results Relating to Venture Stage and Industry Diversification

For Finland, as the tau-b correlation coefficients suggested, there is a significant relationship between the VCFs' preferred stage index and industry diversification. This relationship is even stronger, when we control for the capital under management and preferred geographic scope. The negative relationship between industry diversification and the stage index seems to be the case both in preferred investment strategies and in practice, but tends to be stronger in practice. Later venture stage index implies industry focus rather than industry diversification in Finland. These results are in conformity with the portfolio theory and support the hypothesis H1a.

[*] Using the preferred industry diversification as a control variable has two advantages. First, it provides more data points. Second, it is consistent to use the preferred industry diversification along with the other variables, which are also based on investment preferences. However, for Finland, industry HHI was used as the control variable, because the variable 'preferred industry diversification' has a low variance. 73 percent of the Finnish VCFs have no industry preferences.

In the Israeli sample, the results are very different from the Finnish results. Those venture capital funds, which stated that they prefer to invest in late stage ventures also stated that they prefer to diversify across a large number of different industries. Hence, intended strategies of the Israeli venture capital funds are in line with the specialization hypothesis. These intended strategies seem to only partially be realized, as actual investment data shows not as strong relationship between the preferred stage index and actual industry diversification (p=0,052). This may be partially due to the youth of the venture capital industry, where young funds may not have had enough time to realize their intended strategies. Nevertheless, I interpret these results in favor of the specialization hypothesis H1b.

There are several possibilities why Finland and Israel differ dramatically regarding venture stage and industry diversification. First, the industry categories are more general in Finland than in Israel, which should lead to lower industry diversification in Finland. However, the previous results showed that this is not the case, and the Finnish VCFs are, in fact, more diversified across industries. Second, Finnish VCFs are much more concentrated regarding their preferred stage index - concentrating on expansion and buy-outs stages - as shown in Figure 9. Hence, the results may be sensitive to those companies representing either early or late stage - for example SFK Finance and Sitra, which have well diversified portfolios, yet focus on early stage. Third, private VCFs investing in the late stage have invested largely in general industries, such as consumer-related, and industrial production and services, which both count as one single industry in this research.

The fourth and most probable reason for the difference between Israel and Finland is related to the percentages of companies in high-tech industries. Recall that the percentage of high-tech companies was nearly twice as much, and the amount of capital invested in high-tech nearly three times as much in Israel as in Finland. In addition, the data suggest that those VCFs investing in early stage have a larger propensity to invest in a high-tech industry. The percentage of high-tech companies is negatively correlated with preferred stage index in Israel, when industry diversification, capital under management and geographic scope are controlled for (p=0,055). Although the sign of the correlation coefficients is the same in Finland as in Israel, high-tech would seem to not significantly affect preferred stage index (p=0,297). In summary, these results suggest that the cost of gaining knowledge in high-tech industries is higher than in low-tech industries.

Fifth, perhaps the most interesting, explanation for the difference relates to post-investment activities. Recall that the portfolio theory suggested that those VCFs focusing on the early

stage ventures, that is, more risky investments, ought to be more diversified than VCFs that invest in late stage ventures, all other things the same. Hence, the Finnish results are in line with the portfolio theory. An underlying assumption was that the VCFs are more or less acting as passive investors and are not adding value in their portfolio companies. It follows that the Finnish VCFs, which focus on early stage, would seem to believe they are not able to add sufficiently value to their portfolio companies to compensate the additional risk associated with the early stage investment.

7.1.3. Geographic Scope

In the Finnish sample, when we control for stage index and capital under management, the partial correlation between industry HHI and preferred geographic scope is significant at 2,1% confidence level. This finding is in conformity with the hypothesis H3b.

However, the correlation between the preferred geographic scope and preferred stage index is negative at 11% confidence level, when I control for capital under management and industry HHI. Thus, there is not clear support for the hypothesis H3a on the VCF level. Interestingly, when I study individual portfolio investments, early stage ventures seem to be closer to the VCF's office than later stage ventures. This result is taken from the significant positive correlation between portfolio company's proximity to VCFs office, and the number of employees in the portfolio company (p=0,000; N=365). This implies that larger ventures tend to be further from the VCFs office than smaller ventures. Hence, all though there is no clear evidence on the VCF level that early stage ventures are closer to the VCFs office, it can be argued that this occurs on an investment by investment basis.

In Israel, the initial results from tau-b correlation suggest that those venture capital funds focusing on early stage would look for their portfolio companies within a narrower scope as expected. However, the relation is not significant (p=0,077) and when I control for either actual or preferred industry diversification and capital under management, the correlation coefficient becomes clearly insignificant (p=0,246/p=0,408). Therefore, I reject the hypothesis H3a regarding Israel.

In the Israeli sample, as expected, industry diversification seems to be negatively related to the geographic scope. When capital under management and the preferred venture stage index are controlled for, correlation between preferred industry diversification and geographic scope is negative at a 7,1% confidence level. Moreover, actual industry diversification and

geographic scope are also negatively correlated (p=0,077). These results give support to my hypothesis regarding industry-, and geographic diversification.

In the Israeli sample, preferred stage diversification would also seem to be negatively related with the preferred geographic scope. This result can be obtained from the statistically significant negative partial correlation between the preferred stage diversification and preferred geographic scope (p=0,052), when the amount of fund capital, preferred industry diversification, and preferred stage index are controlled for. For the Finnish sample the relationship between the geographic scope and stage diversification was insignificant.

In summary, geographic diversification seems to be a substitute rather than a complement for industry or venture stage diversification. There are at least two possible reasons for VCFs to do so. First, those VCFs, which have decided to focus on certain industries or venture stages, compensate the lack of industry or venture stage diversification by diversifying across broader geographic scope to reduce financial risk. Second, a broader geographic scope helps VCFs to maintaining a sufficient deal flow, and enables larger funds to be allocated on specific industries or venture stages.

7.1.4. Capital Under Management

In the Finnish sample, when I control for both the preferred stage index and the geographic scope, the correlation between capital under management and the actual industry diversification becomes positively significant (p=0,010). However, the relationship between preferred industry diversification and capital under management is not as strong as in actual investments. There are several possible explanations. First, the result may be due to a biased variable. The reader is reminded that the preferred industry diversification may be a biased measure because 73 percent of the Finnish VCFs stated that they had no industry preferences. Second, those VCFs with large capital under management are likely to face pressure to invest the capital somewhere. If there are not enough potential deals in the preferred industries, VCFs may be tempted to invest in other industries, even outside their preferred industry scope, in order to make a sufficient amount of portfolio investments.

Also, my other hypothesis receives strong support. Those VCFs with a large pool of capital under management prefer to operate in a broad geographic scope. Even when the preferred/actual industry diversification, and preferred stage index are controlled for, the correlation is significantly positive (p=0,013/0,001)

In the Israeli sample, the Tau-b correlation coefficients suggest that both measures of industry diversification were significantly related to the amount of fund capital. However, when the geographic scope and the preferred stage index are controlled for, the correlation between actual industry diversification and the amount of fund capital reduces and is significant at 6,9 percent confidence level. However, the partial correlation between the preferred industry diversification and amount of fund capital is clearly insignificant. Hence, the results give only weak support for the hypothesis H4a.

Partial correlation analysis reveals that the amount of fund capital is significantly positively related to preferred geographic scope (p=0,018), as hypothesized. The result supports hypothesis H4b.

Needless to say that because late stage ventures are larger the average investment size larger, and that venture capital funds concentrating on late stage ventures tend to have more capital under management.

REGRESSION ANALYSIS OF ACTUAL INDUSTRY DIVERSIFICATION

Now that I have examined the partial correlation coefficients between the variables in the circular model of diversification, I will deepen the analysis with a multiple linear regression analysis, which simultaneously takes into account several predicting variables. A multiple regression analysis is used to explain the influence of several independent variables on a dependent variable[121]. My aim is to explain the variables that affect actual industry diversification - that means that industry HHI is used as the dependent variable. Adjusted R^2 is commonly used to measure the power of the model. The same independent variables that were used in the partial correlation analysis were also used in the regression analysis. In addition, the actual number of portfolio companies was initially added to the model, because it correlated significantly with the industry HHI, for the reasons discussed earlier. One assumption of the multiple linear regression model is the multivariate normality of the variables. To test normality, skewness and kurtosis of the distribution, and the one-sample Kolmogorov-Smirnov test were used. A couple of variables we transformed to achieve better conformance with the normality assumption. In appendix 4, the results from the normality

[121] Ghauri, P, Gronhaug, K, Kristianlund, I. 1995 Research Methods in Business Studies. Prentice Hall. New York. pp 114-116

tests of the original and of the transformed variables are summarized. I used the list-wise exclusion option in the SPSS® software package to exclude cases with missing data.

Tables 9 and 10 present the multiple regression models of actual industry diversification for Finland and Israel. The tables present regression models that consist of those variables that remained in the model because of significant correlation with the actual industry diversification. Hence, non-significant predictors were excluded from the model. A stepwise procedure was used to calculate the regression in order to reduce the risk of instability due to the collinearity of the variables.

Table 9 Multiple linear regression analysis of actual industry diversification for the Finnish sample

	Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	T	Sig.
(Constant)	38,118	9,390		4,060	0,001
Stage index	16,796	3,830	0,689	4,386	0,000
Amount of capital under management transformed	-6,658	1,801	-0,755	-3,696	0,002
Geographic scope	6,382	1,976	0,646	3,230	0,005

Predictors: (Constant), stage index, amount of capital under management transformed, geographic scope
Dependent Variable: industry HHI
Adjusted R^2=0,563; F=9,8317; p=0,001

In Finland, all the three variables in the circular model relating with industry diversification were significant in the regression model, and explained 56 percent of the variance in actual industry diversification*. The directions were the same as suggested by the partial correlation analysis. These results give further support to the hypothesis.

In the Israeli sample, the amount of fund capital was eliminated from the regression model, whereas the actual number of portfolio companies remained in the model. The other two remaining variables, preferred stage index and geographic scope, of the circular model are statistically significant in explaining industry diversification. The three remaining predictors explain 54 percent of the variance in the actual industry diversification in Israel.

* In the Finnish sample, the actual number of portfolio companies became insignificant, and was eliminated from the regression model.

Table 10 Multiple linear regression analysis of actual industry diversification for the Israeli sample

	Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
(Constant)	77,622	8,162		9,511	0,000
Stage index	-3,783	1,713	-0,238	-2,209	0,034
Geographic scope	6,036	2,870	0,227	2,103	0,043
Actual number of portfolio companies transformed	-12,417	1,966	-0,681	-6,315	0,000

Predictors: (Constant), stage index, geographic scope, and actual number of portfolio companies transformed
Dependent Variable: industry HHI
Adjusted R^2=0,546; F=9,8470; p=0,000

7.1.5. Discussion of the Circular Model of Diversification

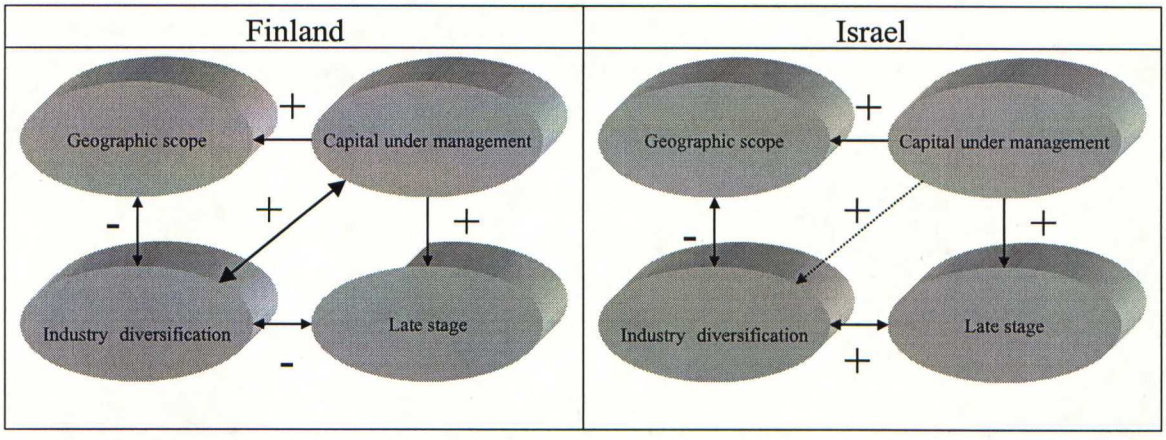

Figure 18 Circular model of diversification for Finland and Israel

Figure 18 shows the final circular diversification models for Finland and Israel. First, as expected, capital under management was positively related to the preferred geographic scope, and to late venture stage in both sample countries*. Second, the preferred geographic scope seemed to be negatively related to industry diversification in both sample countries. Third, the preferred geographic scope seemed to be negatively related to the preferred stage diversification in Israel. These results suggest that geographic diversification would seem to be a substitute rather than a complement for industry and venture stage diversification.

In Finland, according to the portfolio theory, VCFs investing in late stage ventures preferred less industry diversification and also in reality were less industry-diversified. On the other

*Capital under management is positively related to industry diversification in Finland, but the relationship is not as strong in Israel. Although capital under management is on average larger in Finland, the median test showed no significant difference between the countries (p=0,214). In the interviews, large Finnish venture capitalists claimed that there are not enough potential companies in any particular industry to permit large funds to be committed purely in it. Hence, there may be a better deal flow in Israel than in Finland, which allows even larger venture capital funds to concentrate on certain industries.

hand, venture capital funds in Israel seemed to operate according to the specialization hypothesis. The hypotheses regarding diversification were based on from previous studies carried out in US. Israel and US venture capital industries share a lot of similarities, such as focus on small high-tech ventures, whereas Finland represents a European style of venture capital, where the emphasis is more on mature low-tech ventures. The most probable reason for this distinctive difference is the large difference in the share of high-tech investments between the countries. The results suggest that the cost of gaining knowledge is higher in high-tech than in low-tech industries. An other interesting explanations is that Finnish VCFs, which focus on early venture stages, are unable to add sufficiently value to their portfolio companies and are, therefore, better off diversifying their portfolios across a large number of different industries.

7.1.6. Results of Stage Diversification

If VCFs specialize on certain venture stages, then the percent of capital in a given stage should be positively related to those of nearby stages as a result of follow-on investments. In addition, a negative relationship should exist between non-consecutive venture stages.

Table 11 shows the correlation between the actual percent of capital invested in a given venture stage for the Finnish sample. The data was obtained from 16 Finnish VCFs through the questionnaire. Looking at the table, the pattern is clear. All correlation coefficients are positive with the neighbor stages and negative with the non-consecutive stages. The only exception from this rule is that other early stage and seed financing are positively correlated, although they are not consecutive stages*. However, most of the coefficients are insignificant. Hence, I may only interpret these results as giving weak support for the specialization hypothesis H2b.

* I left the turnaround stage out of the analysis, because it does not fit into this theory as well as the other stages. The turnaroud stage does not represent well the stage in which the company is. Usually turnaround occurs at a late stage, but it could also occur at a quite early stage.

Table 11 The Kendall tau-b correlation coefficients relating to VCFs' venture stage diversification for the Finnish sample

	Seed	Start-up	Other early stage	expansion	MBO/MBI
Start up	0,073				
	sig. ,361				
Other early stage	0,134	0,152			
	sig. ,256	sig. ,216			
Expansion	-0,032	-0,046	0,036		
	sig. 439	sig. ,408	sig. ,426		
MBO/MBI	-0,038	-0,308	-0,587**	0,056	
	sig. ,431	sig. ,069	sig. ,002	sig. ,395	
Bridge	-0,041	-0,250	-0,047	-0,024	0,303
	sig. ,427	sig. ,119	sig. ,412	sig. ,455	sig. ,091

Table 12 The Kendall tau-b correlation coefficients relating to VCFs' venture stage diversification for the Israeli sample

	Incubation	Seed	Start-up	Other early stage	Expansion
Seed	0,526**				
	sig. ,000				
Start-up	0,140	0,431**			
	sig. ,219	sig. ,000			
Other early stage	0,078	0,216*	0,572**		
	sig. ,257	sig. ,035	sig. ,000		
Expansion	-,525**	-0,517**	-0,181	-0,108	
	sig. ,000	sig. ,000	sig. ,064	sig. ,182	
Bridge	-,337**	-0,420**	-0,172	-0,120	,557**
	sig. ,002	sig. ,000	sig. ,074	sig. ,156	sig. ,000

Table 12 shows the correlation coefficients relating to Israeli venture capital funds' preferences regarding the venture stage. If the venture capital fund stated making investment in the stage in question, the variable was given a value of one and otherwise it was zero. The data contained 72 Israeli venture capital funds. As can be seen from the Table 12, there is a similar pattern favoring the specialization hypothesis in Israel. In addition, many of the correlation coefficients are significant, which allows me to interpret these results in support of the hypothesis H2b.

7.1.7. Results Relating to Public VCFs in Finland

In order to study how the origin of capital affects the behavior of VCFs, I ran a regression analysis on the actual portfolio investment data. Table 13 shows the result from this regression analysis. The dependent variable, type of the VCF, is either one or zero. The dependent variables are the number of employees in the portfolio company, whether the portfolio operates in a high- or low-tech industry, the portfolio company's proximity to the VCF's office, and the annual sales of the portfolio company. The operationalization of the variables are shown below the table.

Table 13 Multiple regression analysis

	Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	T	Sig.
(Constant)	,419	0,040		10,593	0,000
Number of employees in the portfolio company	2,748E-04	0,000	0,193	3,645	0,000
Portfolio company operates in a high-tech industry	-,218	0,049	-0,222	-4,466	0,000
Portfolio company's proximity to VCFs office	8,417E-02	0,044	0,097	1,923	0,055
Annual sales (million FIM)	1,623E-04	0,000	0,121	2,256	0,025

Predictors: (Constant), Number of employees in the portfolio company, Portfolio company operates in a high-tech industry (high-tech=1 and low-tech=0), Portfolio company's proximity to VCFs office (same state=0;other Finnish state=1;abroad=2), Annual sales (million FIM)
Dependent Variable: Type of the VCF (public=0;private=1)
Adjusted R^2=0,119; F=13,50; p=0,000

The results give strong support for both of my hypotheses relating to public funds. First, public funds have a significantly higher propensity to invest in high-tech firms than private VCFs do (p=0,000). Second, public VCFs have a significantly higher propensity to invest in smaller companies, both in terms of employees (p=0,000) and sales (p=0,025). In addition, public VCFs in general are more locally oriented according to their actual portfolio investments (p=0,055).

In addition, there are some interesting results that can be obtained from investment preferences using the tau-b correlation analysis. First, public VCFs prefer a narrower geographic scope than privately owned firms do (p=0,025). Second, public VCFs prefer more often minority holdings in their portfolio companies than private VCFs do (p=0,029). Third, public VCFs tend to prefer the early stage (p=0,046) and as a result the average investment size is significantly less than that of private VCFs (p=0,002).

In summary, both of my hypotheses received support. In addition, public funds tend to be more locally oriented both according to their investment preferences and actual investments than private VCFs are. This is probably because there are several public funds, which were originally formed to operate locally in order to boost the local economic activity - Indekon Management Oy, Karinvest Oy, and Savo Investment Management Oy, to name a few. Another explanation relates to public VCFs' focus early stage. Earlier it was shown that early stage tend to be closer to VCFs' offices.

The large amount of government related venture capital in Finland may be one explanation why there seems to be few Finnish private VCFs that focus on early high-tech ventures. If public related have biases in investing in early high-tech ventures, this may result in

overvaluing such companies*. If this argument were true, one would expect the risk-adjusted returns from early stage investment to be relative low compared to late stage investments. Unfortunately, no information on the returns is at this point available from Finland. Another explanation relates to the private bank-related VCFs. Many of the venture capitalists in these firms have their background in the financial sector. Hence, they are likely to be more familiar with later round ventures, such as MBOs, which require more financial know-how than knowledge of running a small business.

7.2. SYNDICATION

This chapter deepens the analysis of the empirical data. First, the results of testing the hypotheses regarding the resource exchange model are presented. Then the relationship between diversification and syndication is explored. Then a regression analysis on syndication is presented along with the presentation of the results from the questionnaire. The chapter ends with a discussion of the results.

7.2.1. Results Relating to Munificence

To measure the degree of scarcity of capital I will use two measures. The first is simply the amount of capital under management, which was previously used as a construct in Bygrave[122].

To study VCFs syndication patterns, I first divide VCFs into two separate groups by median. I use median so that there would be approximately the same number of firms in each group. Then I calculate the sum of intra and intergroup direct links. I also calculate the sum of sole investments, that is, investments that are not syndicated for each group. The parties on the right in Figure 19 represent the two groups. VCFs with more than 90 million of capital under management are considered large and those with less capital under management as small. There are 12 large and 11 small Finnish VCFs of which investments I have data. The bulks on the left and middle represent the share of direct links with the corresponding group. It can be thought of as the probability of syndicating with that group. For example small VCFs have 88 percent of their direct links with large VCFs, and only 12 percent among other small VCFs.

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* One private Finnish venture capitalist claimed that public subsidies worsen the deal flow that venture capitalists receive. The best high-tech companies are able to grow with the subsidies. Only those companies, to which the subsidies are insufficient, apply for venture capital.

[122] Bygrave, W. 1987. Syndicated investments by venture capital firms: a network perspective. *Journal of Business Venturing*, volume 2.

It should be intuitively clear that the absolute number of links between the two groups must be equal. Thus, 32 percent of the direct links of large VCFs equals 29, as does 88 percent of the direct links of small VCFs. This means that large VCFs have made more syndications than small ones. There are three ways in which this condition can be fulfilled. First, large VCFs may have more syndications because they have made more portfolio investments. Second, large VCFs may have more syndications because they have a higher overall propensity to syndicate. Finally, large VCFs may have more syndications because of the combination of these two previous points. As the bulks on the right in Figure 19 reflect the propensities of syndication of the two groups*. The figure shows that large VCFs tend to have a higher propensity to syndicate overall than small VCFs.

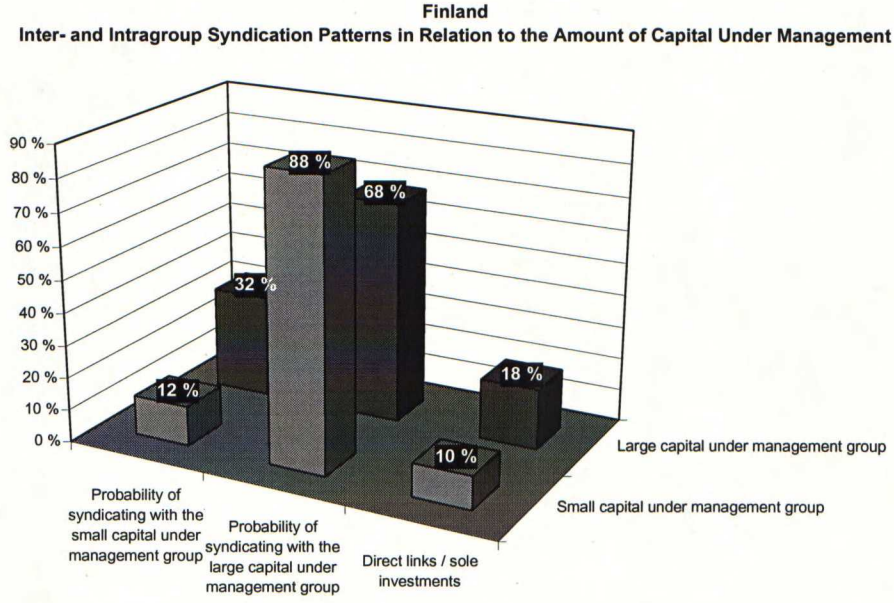

Figure 19 Syndication patterns related to the amount of capital under management for the Finnish sample

* The direct links-to-soles –ratio is a leveraged measure of the propensity to syndicate.

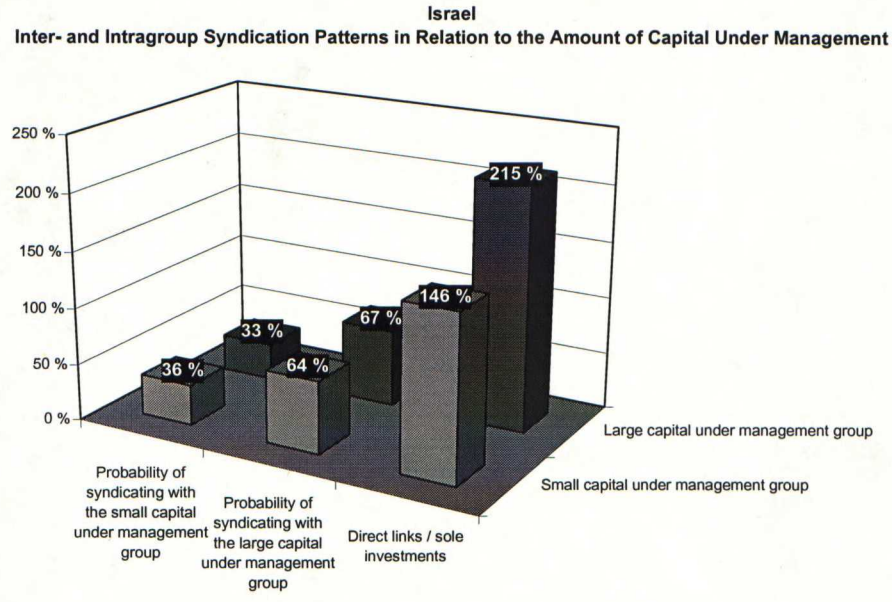

Figure 20 Syndication patterns related to the amount of capital under management for the Israeli sample

Figures 19 and 20 show that the syndication patterns regarding capital under management are very similar in both countries. First, the VCFs with a large amount of capital under management tend to syndicate among other large VCFs. Second, small VCFs prefer to invest with large VCFs rather than within their own group. Third, large VCFs have a significantly higher propensity to syndicate overall (p=0,007). The last result is against my hypothesis, because according to the resource exchange model the lack of capital resources should increase the level of co-investing, all other things equal. The most apparent difference between the counties is that the level of co-investing is much higher in Israel than in Finland.

To test statistically the differences regarding syndication between the groups, I use the Chi-square test, which was also used by Bygrave in his corresponding analysis. The Chi-square test measures the difference between the expected frequency and the observed frequency. The analysis covers 23 Finnish VCFs and 43 Israeli VCFs. It should be noted that the syndications were calculated for each venture capital firm not for each fund also in Israel. Table 14 shows the expected and observed numbers of syndication of large and small Finnish VCFs. The corresponding data for the Israeli VCFs is shown in Table 15. The tables show that VCFs with a large amount of capital under management have a significantly higher propensity so syndicate than small VCFs.

Table 14 Proportion of pairs to sole investments of large and small Finnish VCFs by capital under management

Finland	Small capital under management	Large capital under management
Capital under management (million FIM)	<=90,25	>90,25
Number of VCFs in each group	12	11
Observed number of syndication pairs	33	91
(expected)	(45,7)	(78,3)
Observed number of sole investments	164	246
(expected)	(151,3)	(258,7)

X^2=7,33; df=1; p=0,0068

Table 15 Proportion of pairs to sole investments of large and small Israeli VCFs by capital under management

Israel	Small capital under management	Large capital under management
Capital under management (million FIM)	<=24	>24
Number of VCFs in each group	22	21
Observed number of syndication pairs	516	262
(expected)	(500,8)	(277,2)
Observed number of sole investments	120	90
(expected)	(135,2)	(74,8)

X^2=6,08; df=1; p=0,0137

Here, I must make a comment on the validity of the measure. The amount of capital under management has several weaknesses in measuring the scarcity of capital resources. First, capital under management ignores the amount of capital already invested. Thus, a more appropriate measure, in my opinion, would be the capital available for investments, because it represents the amount of capital a venture capital firm can invest without a need to raise additional capital. Second, because venture capital firms have different investment strategies, which relate to different average investment sizes, the absolute amount of capital available for investment is likely to be an inadequate measure. For example, ten million may be a sufficient amount for a VCF focusing on seed stage to finance 20 portfolio companies. The same ten million may only allow another VCF to invest in one late stage investment. Surely, the late stage investor would face a more severe scarcity of capital resources. Third, capital under management is taken from a certain point of time, whereas the obtained syndications may have occurred during several years. A VCF may have lacked capital resources in the past but has raised funds recently, and hence now shows not to have any scarcity of capital.

The first two weaknesses can be circumvented by dividing the amount of capital available for investment by the average investment size. Unfortunately, the third and perhaps the most important problem remains. Thus, the results must be regarded as suggestive only.

My second construct of capital resources was calculated as the capital available for investment divided by the average investment size. Here the average investment size was assumed to be

in Finland the typical investment size and in Israel the average of maximum and minimum investment. The results were similar in Israel to those above. Those Israeli VCFs, which had large relative capital resources, had a significantly higher propensity to syndicate (p=0,015). However, the relationship between the propensity to syndicate and the capital resources became insignificant for the Finnish sample (p=0,39).

To measure the scarcity of deal flow of prospective investments, I asked venture capitalists in the questionnaire about the approximate number of proposals per one investment. Unfortunately, half of the respondents failed to answer the question, and with only 9 responses from Finland and 5 from Israel, it would have been unreasonable to make any empirical tests. Hence, I must conclude that I was unable to test the hypothesis H6b empirically. The reason for the low number of responses of deal flow is likely to be due to the characteristics of information, which seems to be both hard to obtain and sensitive in nature.

7.2.2. Discussion Relating to Munificence

The results would seem to suggest that Israeli venture capital firms with a large amount of capital resources might have a higher propensity to syndicate than VCFs with small capital resources. However, munificence proved to be very difficult to measure. Forming a good construct of scarcity of capital resources would require a dynamic variable and a longitudinal study, which would take into account that both the VCF's capital resources and its propensity to syndicate change over time. I was not able to form such a construct. In addition, I was unable to empirically test the scarcity of deal flow, because of the low number of replies. Hence, the empirical results relating to munificence cannot be regarded as highly valid, and ought to be interpreted with caution. I interpret these results as neither giving support to nor against my hypotheses.

7.2.3. Results Relating to Concentration

I will use two measures of concentration. The first is simply the amount of capital invested, which was used in Bygrage (1987). The second relates to the proximity of VCFs offices.

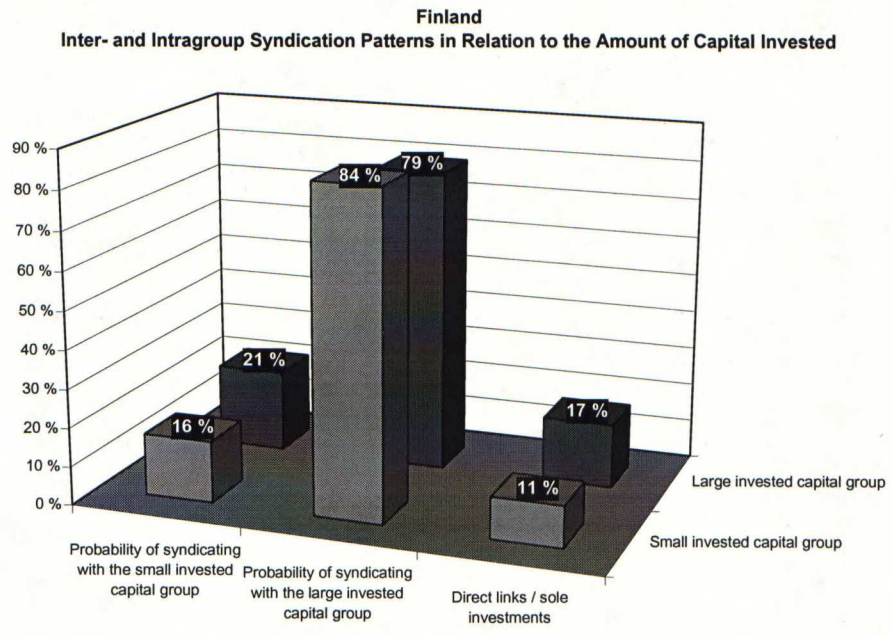

Figure 21 Syndication patterns related to the amount of capital invested for the Finnish sample

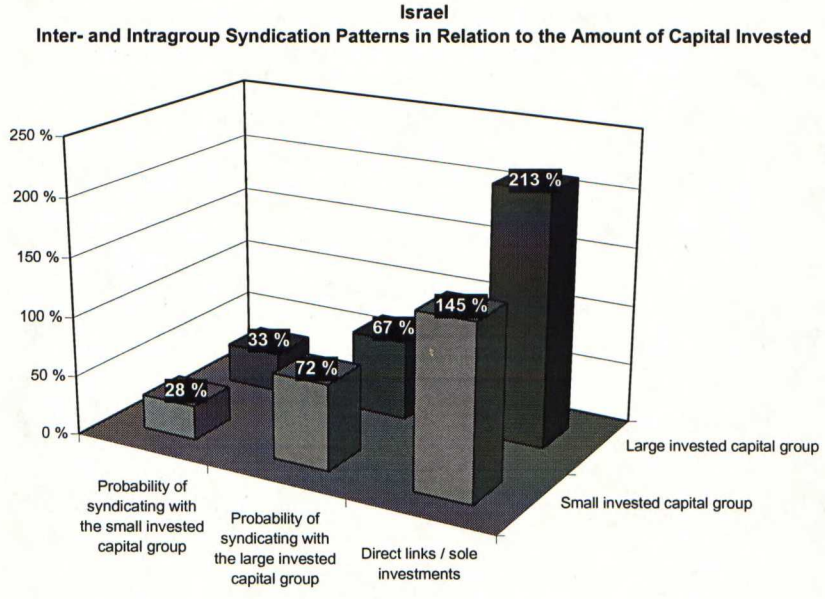

Figure 22 Syndication patterns related to the amount of capital invested for the Israeli sample

Figures 21 and 22 show that the syndication patterns regarding the amount of capital invested are very similar in both countries. First, large investors syndicate significantly more often among other large investors as hypothesized (p=0,000). Second, small VCFs prefer to invest

with large VCFs rather than within their own group. Third, large VCFs have a significantly higher propensity to syndicate overall in Israel (p=0,016), and in Finland (p=0,071) than small VCFs.

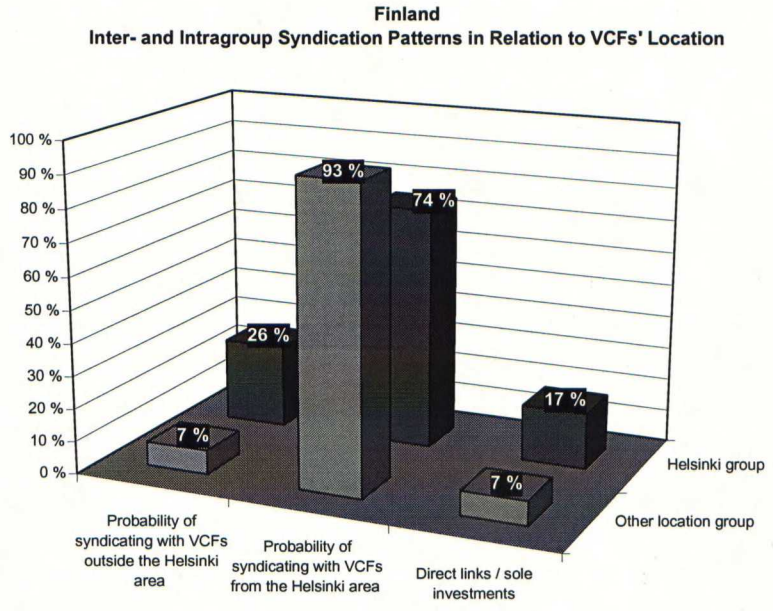

Figure 23 Syndication patterns related to VCFs' location for the Finnish sample

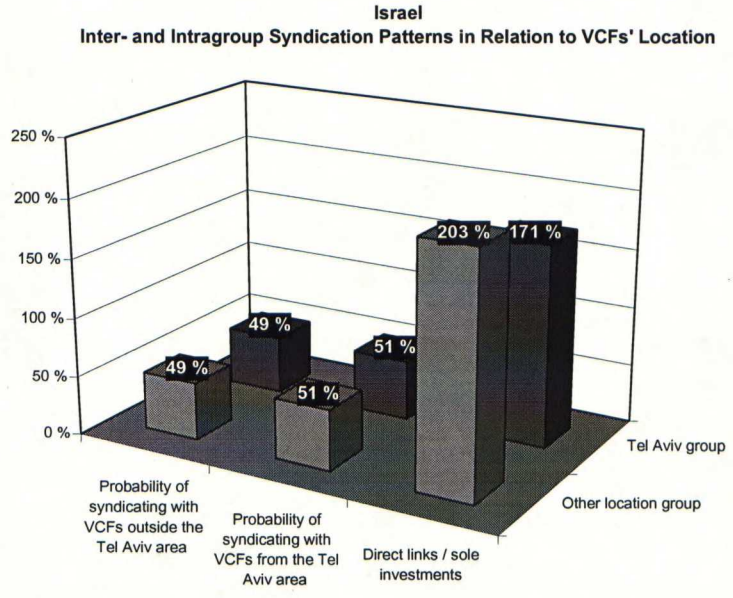

Figure 24 Syndication patterns related to VCFs' location for the Israeli sample

In Israel, VCFs are concentrated in Tel Aviv. 21 out of the 43 VCFs from which I had actual portfolio investments are located there. In Finland, the industry is even more concentrated on

the Helsinki area – 15 out of the 23 VCFs from which I had actual portfolio investments are located there.

In Helsinki, this high concentration seems to have a strong impact on syndication patterns. First, VCFs outside Helsinki seem to almost exclusively syndicate intergroup. Second, VCFs from Helsinki have a significantly higher propensity to syndicate intragroup than with VCFs outside Helsinki, as hypothesized (p=0,000). Third, those VCFs located in Helsinki, have a significantly higher overall propensity to syndicate than those VCFs outside Helsinki (p=0,000). This higher overall propensity to syndicate may be a result of the higher concentration and competition in the Helsinki area.

In Israel, contrary to the findings in Finland, the high concentration in Tel Aviv area does not affect syndication patterns. Those VCFs located outside Tel Aviv are just as likely be syndication partners as those in Tel Aviv (p=0,565). Moreover, those VCFs outside Tel Aviv have a slightly higher propensity to syndicate than those from the Tel Aviv area (p=0,279). These results do not give support to my hypothesis.

7.2.4. Discussion Relating to Concentration

The amount of capital invested was positively related to the propensity to syndicate in both countries. Moreover, VCFs with large amounts of capital invested preferred to syndicate among each other. The five largest Finnish VCFs in terms of the amount of capital invested account for 74 percent of the total capital invested and for 22 percent of the number of VCFs in my syndication study. The corresponding numbers for Israel are ten, 74 percent, and 23 percent. Hence the level of concentration seems to be approximately the same in the sample countries in terms of capital invested. Also VCFs' degree of geographical concentration in the Helsinki and Tel Aviv area are similar.

In summary, Finland and Israel seem to have a relatively similar degree of concentration in terms of capital invested and the location of VCFs' offices. Hence, these measures of the level of concentration do not seem to explain why Israeli venture capital firms have a substantially higher propensity to syndicate than their Finnish counter-partners.

However, portfolio companies' geographic concentration may provide an answer. In Finland, 26 percent of the capital is invested in portfolio companies located in Southern Finland. The corresponding number for the Tel Aviv area is 67 percent. This high concentration of Israeli portfolio companies in the Tel Aviv area may force the VCFs outside the region to syndicate

with the VCFs in the region, in order to obtain deal flow. This phenomenon would also explain the high number of intergroup syndication in Israel.

7.2.5. Results Relating to Uncertainty

The exchange resource model states that uncertainty increases the propensity of syndication. The uncertainties studied in this chapter relate to the risk associated with early stage and technology of the portfolio company. These uncertainties were examined in Bygrave (1987). In addition, the uncertainties relating to venture stage, industry, company and geographic diversification are explored.

UNCERTAINTY RELATED TO VENTURE STAGE

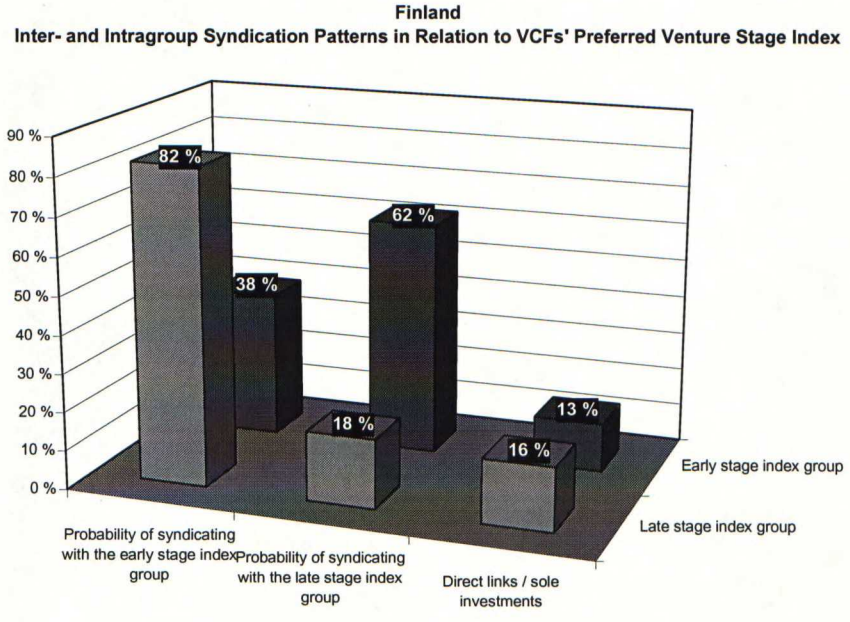

Figure 25 Syndication patterns related to venture stage index for the Finnish sample

In Finland the venture stage index tends to divide VCFs into two groups, early and late VCFs, that have a relatively low level of interconnection. Both late stage and early stage VCFs prefer to syndicate within their own group. Hence, venture stage index seems to explain well with which VCFs syndicate. However, the venture stage does not seem to affect the overall level of syndication on the VCF level, since both groups have similar links to soles- ratios (p=0,256). However, the correlation coefficients from actual portfolio company investments, shown in Table 16, indicate that late stage ventures are significantly more likely to be syndicated than early stage ventures.

Table 16 The Kendall tau-b correlation coefficients between the construct relating to external syndication and venture stage characteristics for the Finnish sample

		Number of employees	Sales (millions of FIM)
External syndication	Correlation Coefficient	,124**	0,052
	Sig. (1-tailed)	0,002	0,115
	N	365	371

In summary, there seems to be strong evidence against the hypothesis H8a, and I therefore conclude that late stage implies external syndication in Finland.

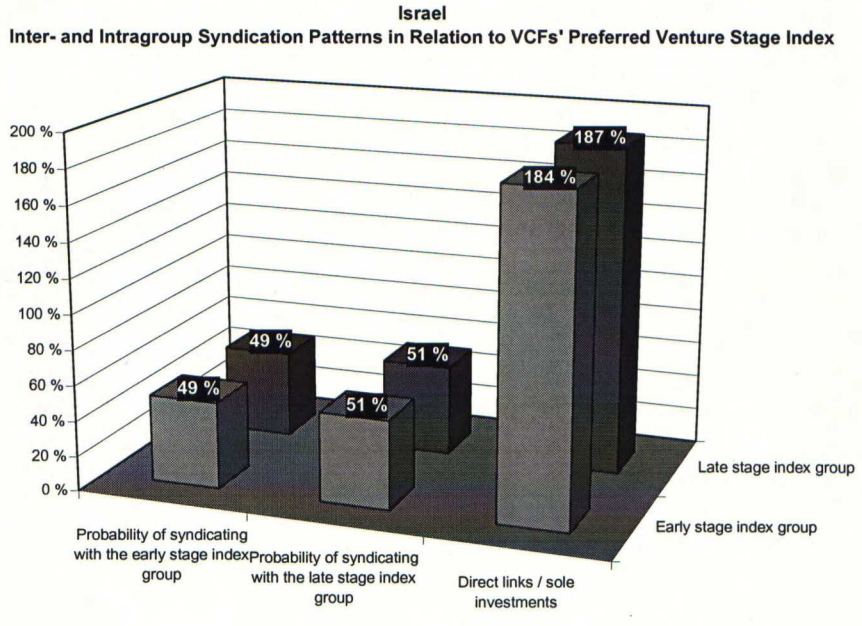

Figure 26 Syndication patterns related to venture stage index for the Israeli sample

Figure 26 illustrates how the VCFs' venture stage index affects syndication patterns in Israel. Actually, the venture stage index does not seem to affect syndication patterns at all. VCFs focusing on early stage ventures are just as likely to syndicate intragroup as they are to syndicate intergroup. The overall propensities of syndication of the groups are equal as well (p=0,913).

An explanation for this lies in the dynamics of round financing. The focus of Israeli investments has been on smaller, earlier stage companies, which have grown rapidly in a short time. Thus, it is common for a portfolio company belonging to a VCF with an early stage focus to eventually need to be passed to a VCF with a later stage focus. Thus, a dynamic of passing the portfolio company is created, as the early stage firm at least partially exits the investment, and the later stage firm picks it up. If this is true, then one would expect to find a

large number of later-round syndications. Given the relatively low number of later-round syndications compared to first-round syndications in Finland, there is little evidence that this dynamic takes place consistently in Finland over this period of analysis. Unfortunately, I was unable to further validate this explanation, because I lacked the data from later-round syndications in Israel.

Contrary to my hypothesis and to what previous research has found from US, early stage does not imply higher propensity to syndicate in either of the sample countries. In fact, the results suggest the opposite is more likely to be the case.

UNCERTAINTY RELATED TO TECHNOLOGY OF THE PORTFOLIO COMPANY

Investments in high-tech industries increase the likelihood of syndication. There is strong evidence in both countries in support of my hypothesis. The finding is consistent with finance theory, since risky high-tech investments ought to be syndicated more often than low risk investments. Regression analysis reveals that high technology explains only 5,4 percent of all syndications. The relationship is, however, significant - as Table 17 shows.

Table 17 Regression analysis model of external syndication for the Finnish samle

	Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
(Constant)	,170	,030		5,573	,000
Portfolio company operating in a high-tech industry	,108	,044	,125	2,463	,014
Number of employees in the portfolio company	2,775E-04	,000	,219	4,317	,000

Predictors: (Constant), Number of employees Portfolio company operating in a high-tech industry
Dependent Variable: external syndication
Adjuster R^2=0,060; F=12,675 (p=0,000)

In Finland, syndication patterns are very difficult to explain. Table 17 shows the regression analysis with two predictors. The explanatory power of the model is weak although the model itself is statistically significant. High-tech companies and companies with a large number of employees are more likely to be syndicated than small low-tech companies.

High-tech companies in general, tend to be smaller both in terms of actual investment size as well as measured by the number of employees. In 1997, the average investment size in low-tech industries was in Finland 4,9 million and only 2,8 million in high-tech industries. Moreover, as can be seen from Table 18 the correlation coefficients between the high-tech

code and the number of employees, sales, and percent of ownership are all statistically significant*.

Table 18 The tau-b correlations of high-tech company for the Finnish investment data

		Number of employees	Sales (millions of FIM)	Percent of Ownership
High-tech company	Correlation Coefficient	-,154**	-,195**	-,107*
	Sig. (1-tailed)	0,000	0,000	0,021
	N	365	371	322

Table 19 shows the regression analysis between external syndication and high-tech for the Israeli sample. The results show that also in Israel high-tech implies syndication.

Table 19 Multiple Regression analysis of external syndication and high-tech company for the Israeli investment data

	Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
(Constant)	0,26	0,066		3,911	0,000
High-tech company	0,405	0,07	0,236	5,819	0,000

Predictors: (Constant), HIGHTECH
Dependent Variable: Syndication
Adjusted R^2=0,054; F=33,864 (p=0,000) (N=578)

* Because syndication is also negatively related to ownership and positively related to high-tech, I made a partial correlation test between the ownership percentage and high-tech company, where I controlled for syndication. The test showed that high-tech companies give significantly less ownership to venture capitalists than low-tech ventures (p=0,025)

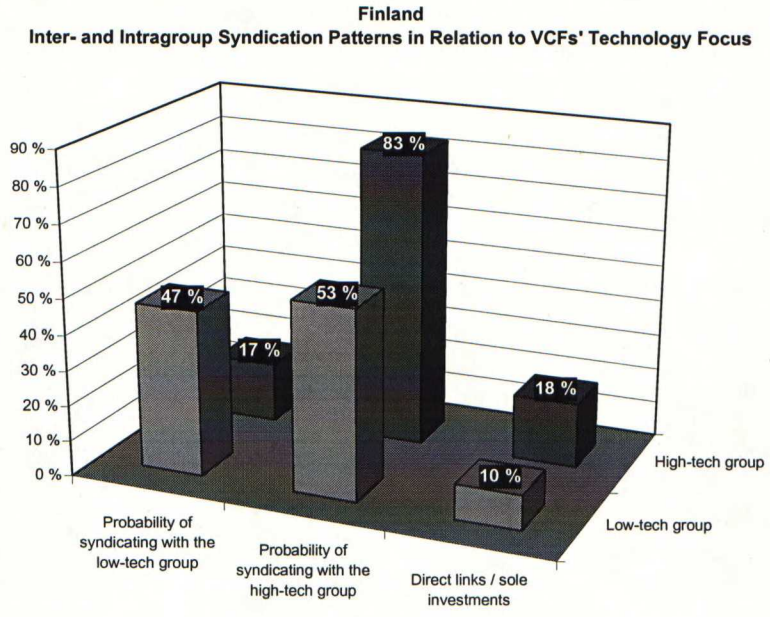

Figure 27 Syndication patterns related to technology intensity of the VCF for the Finnish sample

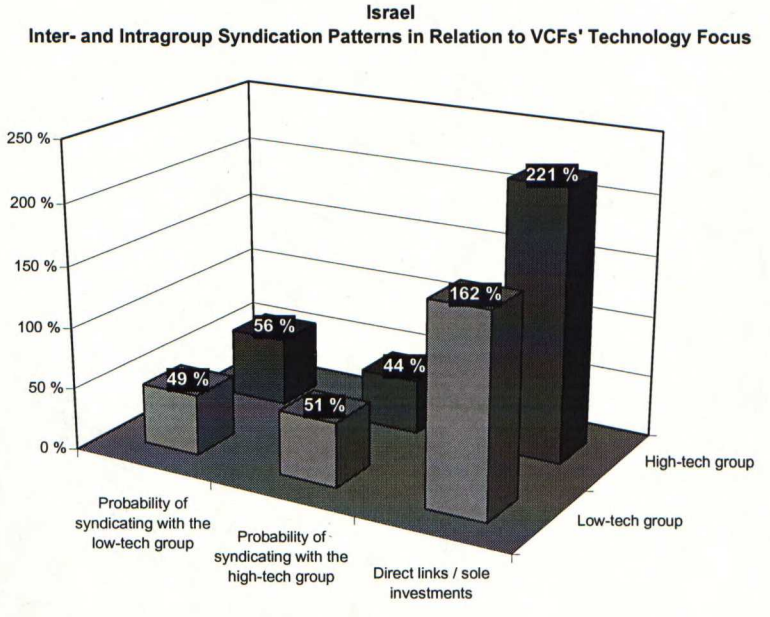

Figure 28 Syndication patterns related to technology intensity of the VCF for the Israeli sample

In the Finnish sample, the VCFs with a large proportion of high-tech companies, tend to syndicate among themselves, whereas low-tech VCFs have as much intragroup- as intergroup-

syndications. As expected, high–tech VCFs have a significantly higher overall propensity to syndicate than low-tech VCFs in Finland (p=0,007).

In Israel, technology intensity does not seem to affect the selection of syndication partners. However, it does affect the overall propensity to syndicate (p=0,047), as in Finland.

UNCERTAINTY RELATED TO INDUSTRY DIVERSIFICATION

Uncertainty increases as the industry diversification decreases. Hence, according to the resource exchange model, one would expect VCFs that have a low degree of industry diversification to syndicate more.

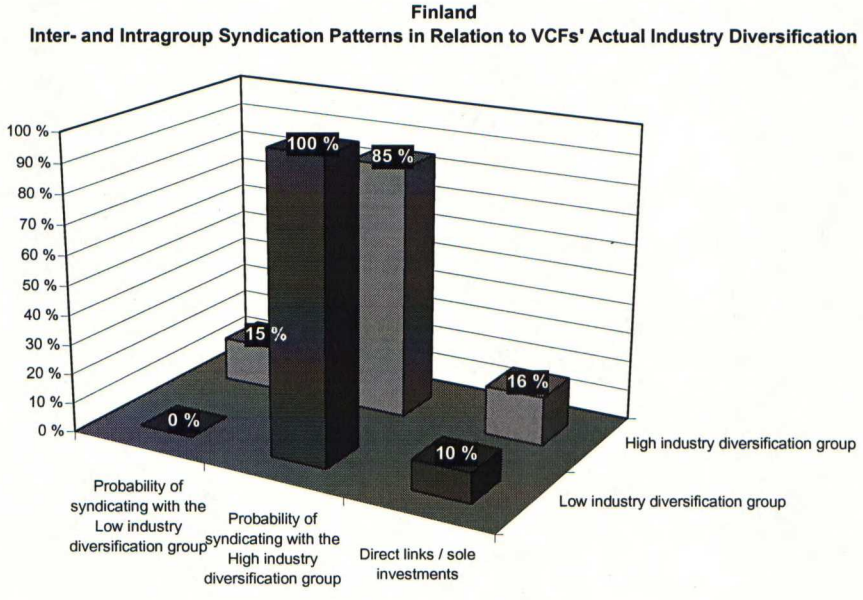

Figure 29 Syndication patterns related to industry diversification for the Finnish sample

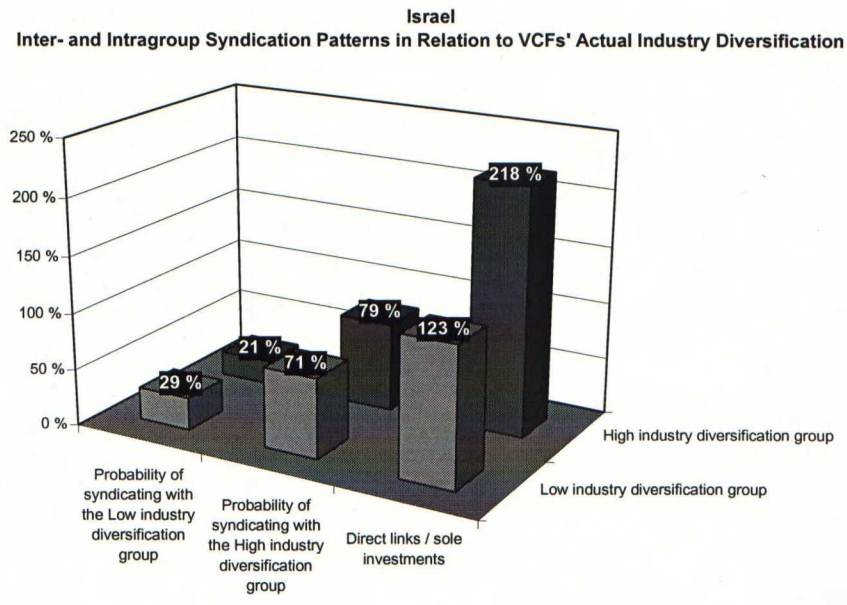

Figure 30 Syndication patterns related to industry diversification for the Israeli sample

The Figures 29 and 30 show that the syndication patterns regarding industry diversification are very similar in both countries. First, VCFs that are well-diversified across industries, tend to syndicate within their own group. Second, industry-focused VCFs prefer to invest intergroup, that is, with industry-diversified VCFs rather than within their own group. Third, industry-diversified VCFs have a significantly higher propensity to syndicate overall in Israel (p=0,001) and in Finland (p=0,093).

Industry diversification is namely one of the possible reasons for VCFs to syndicate. Thus, even tough there is a positive correlation between industry diversification and the propensity to syndicate, we do not know the causality. It may be that VCFs syndicate in order to be able to invest in a greater number of different industries, and as a result, become industry-diversified. Or it may be that VCFs with well industry-diversified portfolios simply syndicate for some other reason. I return to this question in the next chapter, where I discuss the results obtained from the questionnaire.

Uncertainty Related to Venture Stage Diversification

The Figures 31 and 32 show that the syndication patterns regarding venture stage diversification. The results suggests that well stage-diversified VCFs have a higher propensity to syndicate overall in Israel (p=0,058) as well as in Finland (p=0,098). A second interesting aspect of the results is that Finnish VCFs would seem to prefer intragroup co-investing,

whereas Israeli VCFs prefer relatively more intergroup syndications. Once again, one explanation relates to the dynamics of round financing discussed earlier.

In summary, these results give support to the hypothesized reason that VCFs syndicate in order to diversify across venture stages for both sample countries.

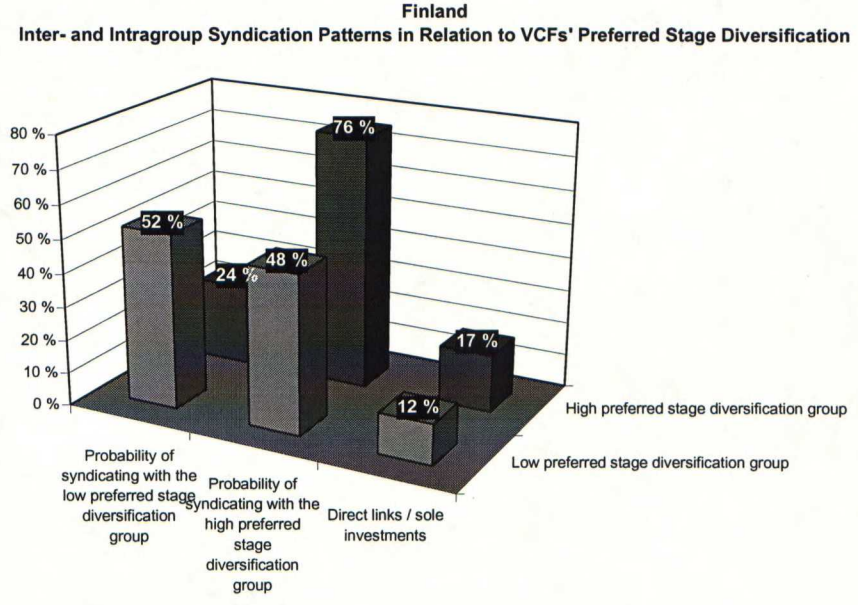

Figure 31 Syndication patterns related to stage diversification for the Finnish sample

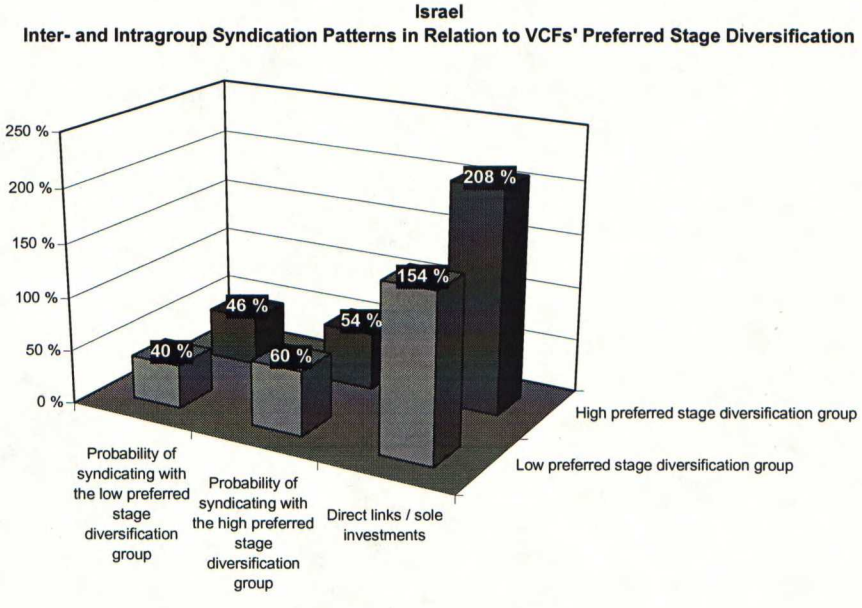

Figure 32 Syndication patterns related to stage diversification for the Israeli sample

UNCERTAINTY RELATED TO GEOGRAPHIC DIVERSIFICATION

The Figures 33 and 34 show that the syndication patterns regarding the VCFs' preferred geographic scope. The results suggests that those VCFs with a broad preferred geographic scope tend to have a higher propensity to syndicate overall in Finland (p=0,094), but not in Israel (p=0,992). Another interesting aspect relates to the relatively high intergroup syndication in Finland. One explanation of this is that those VCFs with a broad geographic scope syndicate with local VCFs, which are likely to have a more active role in assisting the portfolio company. The results regarding the Israeli sample must be considered as suggestive only, because the median of the preferred geographic scope divided the VCFs unevenly to the groups. There the narrow geographic group consists of 33 VCFs, whereas the broad geographic group includes only eight VCFs.

In summary, these results give support to the hypothesized reason that VCFs syndicate in order to diversify geographically for the Finnish sample.

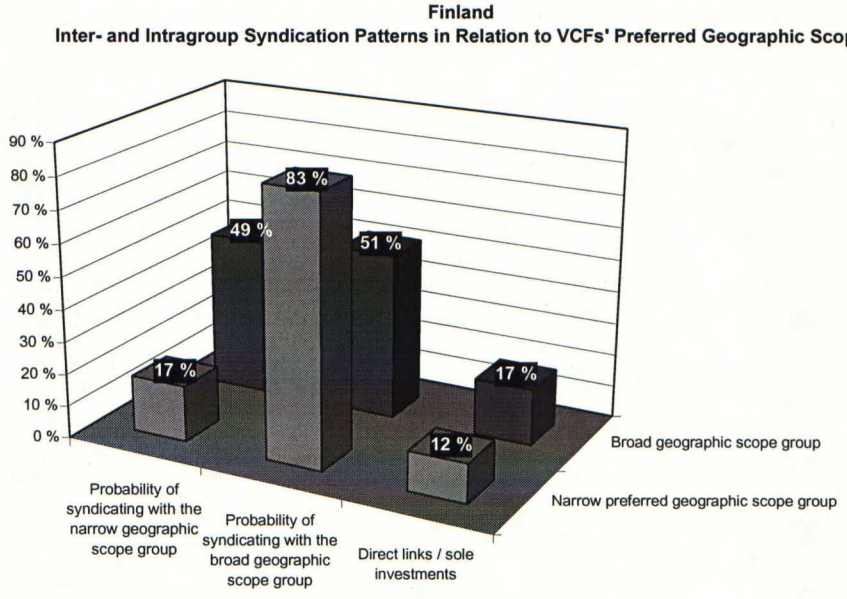

Figure 33 Syndication patterns related to geographic diversification for the Finnish sample

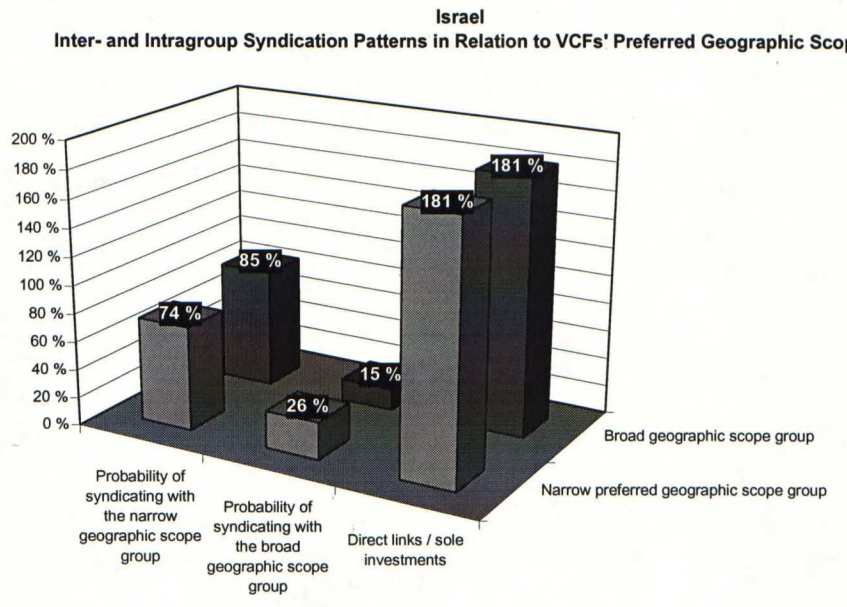

Figure 34 Syndication patterns related to geographic diversification for the Israeli sample

UNCERTAINTY RELATED TO COMPANY SPECIFIC CHARACTERISTICS

The Figures 35 and 36 show that the syndication patterns regarding the company specific risk diversification are very similar in both countries. First, VCFs that have a high number of portfolio companies, tend to syndicate within their own group. Second, those VCFs with few portfolio companies prefer to invest intergroup, that is, with VCFs that have many portfolio companies rather than within their own group. Third, company-diversified VCFs have a significantly higher propensity to syndicate overall in Israel (p=0,000), but not in Finland (p=0,629).

One explanation why VCFs with few portfolio companies prefer to invest intergroup rather than within their own group relates to the accumulation of expertise and experience. More established VCFs may have gained knowledge that young inexperienced VCFs are aiming at obtaining through close relationships. Lerner found that in the first financial round, established venture capitalists tend to syndicate with one another. Later rounds involve less established venture organizations. He argued that these findings are consistent with the view

that syndication allows venture capitalists to obtain information in order to decide whether to invest in a given firm[123].

In summary, these results give support for the hypothesized reason that VCFs syndicate in order to diversify the company specific risk for the Israeli sample.

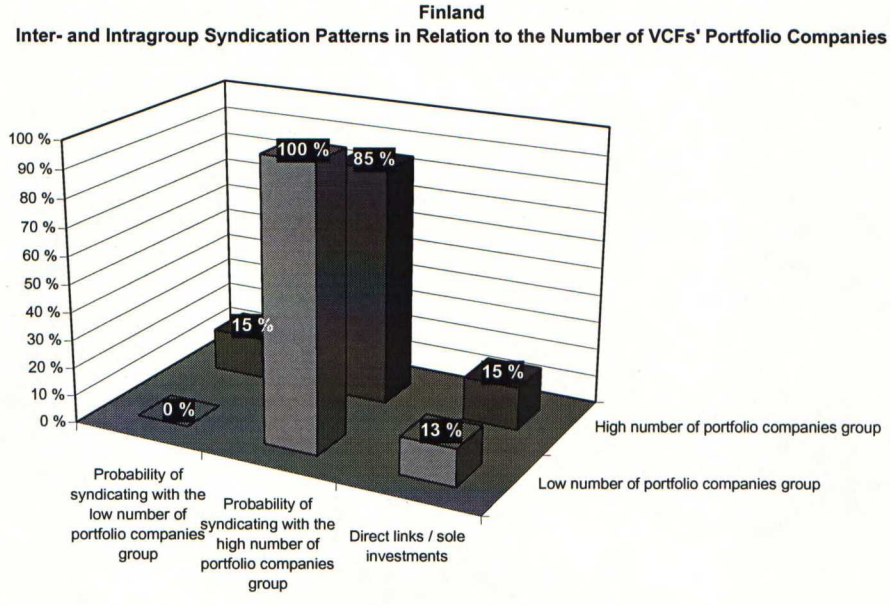

Figure 35 Syndication patterns related to the number of portfolio companies for the Finnish sample

[123] Lerner, J. 1994. The Syndication of Venture Capital Investments. *Financial Management*, volume 23, 3, Autumn 1994. pp25-26

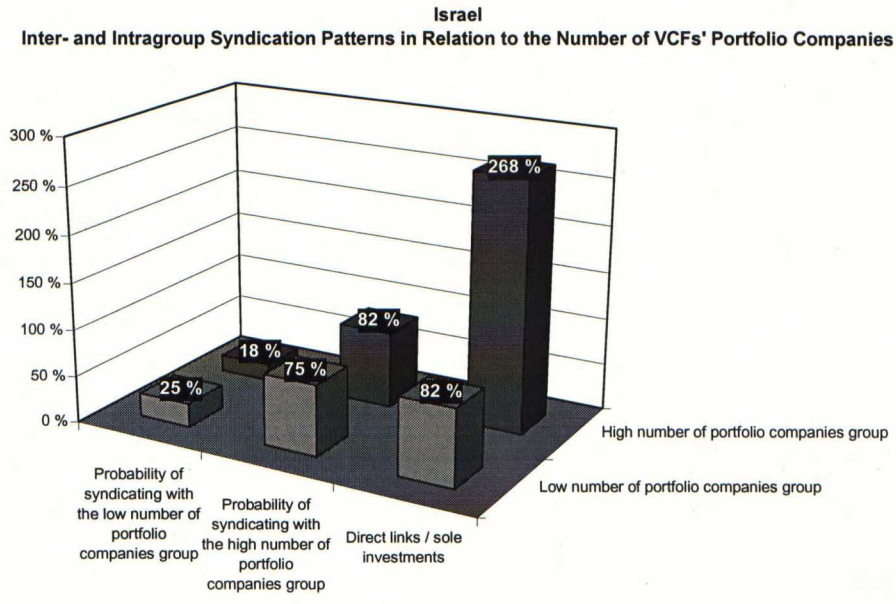

Figure 36 Syndication patterns related to the number of portfolio companies for the Israeli sample

REGRESSION ANALYSIS

Tables 21 and 22 present the results from the regression analysis, which was performed in order to further evaluate how technology, venture stage index, industry diversification, capital resources, geographic scope, and the number of portfolio companies affect the VCFs' propensities to syndicate. The variable propensity to syndicate was used as the dependent variable in the regression model. The tables present regression models that consist of only those variables that remained in the model because of a significant correlation with the dependent variable.

Table 20 Multiple linear regression analysis of venture capital firms' propensity to syndicate for the Finnish sample

	Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
(Constant)	-0,363	0,213		-1,701	0,107
Stage index	0,175	0,083	0,444	2,117	0,049
Percent of portfolio companies in the high-tech industries	0,005	0,002	0,516	2,462	0,025

Predictors: (Constant), Stage index, Percent of portfolio companies in the high-tech industries
Dependent Variable: Propensity to syndicate
Adjusted R^2=0,243; F=4,054;p=0,036

Table 21 Multiple linear regression analysis of venture capital firms' propensity to syndicate for the Israeli sample

	Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
(Constant)	0,686	0,239		2,863	0,006
Industry diversification	-0,006	0,003	-0,304	-2,188	0,034
Percent of portfolio companies in the high-tech	0,003	0,002	0,199	1,433	0,159

Predictors: (Constant), Industry diversification, Percent of portfolio companies in the high-tech
Dependent Variable: Propensity to syndicate
Adjusted R^2=0,092; F=3,375;p=0,043

The regression results suggest that in Finland late stage and technology are the main factors influencing the propensity to syndicate. For the Israeli sample, industry diversification would seem to be the dominant factor leading VCFs to syndicate. Also technology receives weak support in Israel on the VCF level. The main reason why these regression results differ from those results presented earlier is that the data used in the regression gives equal weight to every case, that is, to every VCF. The results presented earlier, on the other hand, gave weights to the VCFs according to the number of investments a given VCF had made.

7.2.6. Discussion relating to Uncertainty

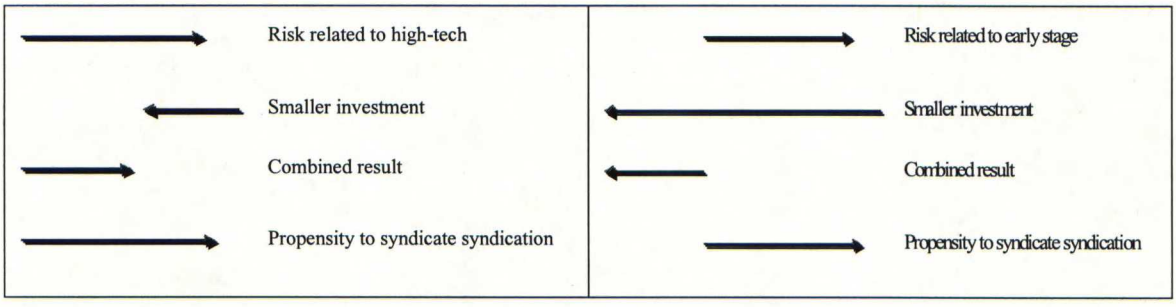

Figure 37 How the risk related to high-tech, early venture stage, and size of investment affects the propensity to syndicate

Figure 37 shows the relationships that were found from both countries regarding the propensity to syndicate. Investment size, high-tech and venture stage can each be thought of as vector pulling the propensity to syndicate into different directions.

High-tech was found to increase the probability of syndication. In addition, we found that high-tech ventures were smaller in terms of average investment. The amount of total capital invested in the portfolio company should, according to the portfolio theory, be positively related to syndication. It seems that the increased level of risk associated with high-tech dominates the decrease in risk associated with smaller investment size. High-tech ventures are only marginally smaller than low-tech ones, which leaves syndication of high-tech ventures more desirable.

The opposite is true with early stage ventures. Even though an early stage investment is considered riskier than a late stage investment, late stage ventures are syndicated relatively more often. This phenomenon can also be explained with portfolio theory. Because early stage investments are often several times smaller than late stage ventures, the risk associated with the early stage is not sufficient to compensate the risk associated with the investment size. Hence, syndicating late stage investment becomes desirable.

Notice that my results are contrary to those of Bygrave[124], who found that in US early stage implied syndication even though the investment size was significantly larger in late stage ventures. Concentration may be another reason why late the stage implies syndication in Finland. Concentration is high in Finland at later venture stages. Because concentration implies syndicatiotions, perhaps that is why we see so many syndications in larger companies rather than early stage ventures.

7.2.7. Reasons to Syndicate

Figure 38 shows the average grades given to different reasons to syndicate. The results were obtained from the questionnaire, where venture capitalists were asked to state the relative importance of the reasons for syndication. The first five bars from the left represent financial risk management reasons to syndicate, whereas the next six bars deal with information sharing issues. The two rightmost bars are calculated by averaging the corresponding bars.

[124] Bygrave, W. 1987. Syndicated investments by venture capital firms: a network perspective. *Journal of Business Venturing*, volume 2. pp 148-149

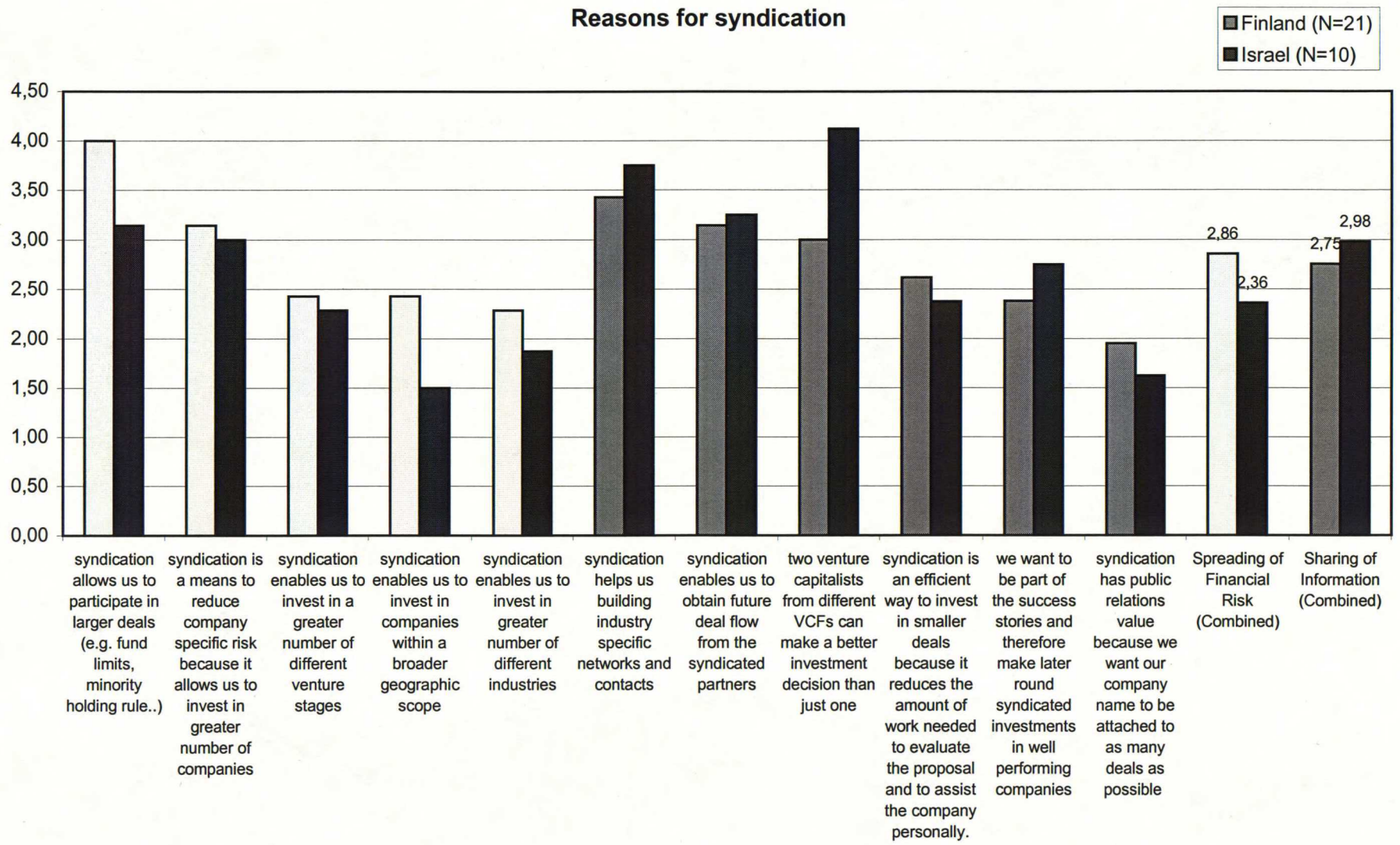

Figure 38 Average grades of the reasons for syndication

Figure 38 shows that venture capitalists from both countries share very similar views of the reasons to syndicate. Consequently, the five most important reasons to syndicate are the same in both countries– allowing larger investments, sharing of deal flow, spreading of company specific risk, building industry-specific network, and making better investment decisions. Three of these five most important reasons relate to the information sharing hypothesis. Two results seem to differ between Israel and Finland. First, Israeli VCFs seem not to syndicate in order to invest in a greater geographic scope. This may be because Israel is not as large as Finland and Israeli VCFs are searching for investment opportunities from the whole Israel from the beginning. Second, Finnish VCFs do not seem to appreciate the joint investment decision procedure as much. This may be due to the lack of Finnish VCFs' industry focus and specific industry expertise. In Finland, a possible syndication partner with low industry focus is likely to know as much - or more likely - as little from the value of the company as the other venture capitalist - hence reducing the value of making a joint investment evaluation.

Empirical results suggested that the different means of diversification are positively related to the level of syndication. The causality, however, is not clear. One could argue that syndication drives diversification, because a high propensity to syndicate enables VCFs to diversify their portfolios, and as a result of syndication they become well-diversified.

On the other hand, those VCFs with well-diversified portfolios may want to syndicate with VCFs, which are more familiar with a given industry, and therefore, in a better position to assist the portfolio company. While both arguments are likely to explain the positive relationship, the latter causality is further supported by the results from the questionnaire. Venture capitalists seem to agree that syndication enables them to diversify across industries, venture stages, companies, and geographic location. Morover, the latter scenario would suggest that VCFs with well-diversified portfolios would preferably syndicate with VCFs specializing in certain industries. However, the results indicate the opposite is true, that is, VCFs with highly industry-diversified portfolios prefer to syndicate among themselves. In summary, the results would seem to suggest that venture capitalists syndicate because they want to diversify their portfolios.

7.2.8. A comment on the network

The venture capital networks in Finland and in Israel are highly connected compared to the previous findings from US. The overall connectedness of the network, that is the percentage of pairs with one or more actual co-investments to the maximum number of all possible pairs,

is 7 percent in Finland and as high as 24 percent in Israel compared to 2,3 percent in US. However, the connectedness of the top 61 VCFs in US was 22 percent, which is close to that found in Israel. Israeli venture capital industry would seem to be tightly coupled, whereas Finland in more on the loosely coupled side. The advantages and disadvantages relating to a tightly coupled network were discussed earlier.

In Finland the network is simple. There is one central party, which accounts for 30,6 percent of the co-investment pairs, and has syndicated with 12 different VCFs. In Israel, the network is more balanced. Gemini Capital Fund Management has the most pairs, but accounts for only 9,1 percent of all the pairs. There are six VCFs that have over 38 co-investment pairs.

7.3. Reliability and Validity Analysis

A basic goal of this study is to provide theoretical explanations for the diversification and syndication behavior of venture capital firms. This requires the research process, that is the development of hypotheses and subsequent testing, to be both valid and reliable. Validity refers to the relationship between a concept and its indicators. Reliability, on the other hand, refers to the correctness of the construct measurement[125].

The data from venture capital firms consists of only the members of the venture capital associations. However, this should not threaten the reliability of the study, since all major players are members of the associations.

In Finland, all the investment preferences were given for each VCF, whereas in Israel the investment preferences were given for each fund. This biases the diversification measures of the Israeli venture capital firms downwards and can partly explain why Israeli VC funds were more industry-focused. If a VCF would have, for example two funds with different investment focuses, this would result in the VCF itself being more diversified.

For validity and reliability of the present study, one crucial link is the operationalization of constructs. Nunnally argues for measures that have been validated in previous research[126]. How desirable this may be, it is in many occasions infeasible, because such constructs do not exist.

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[125] Carmines, E. & Zeller, J. 1979. Reliability and validity. Sage, Newbury Park.

[126] Nunnally, J. 1967. Psychometric theory. McGraw Hill, New York.

The data of actual investment received from the venture capital associations did not include the amount of capital invested in a given portfolio company. In order to receive the information on the capital invested in different industries and venture stages, the questionnaire was sent to VCFs. Because the sample sizes were small to begin with, the number of replies was not sufficient to do statistical analyses. Hence, I was forced to use operational measures, which give an equal weight to every investment. However, the replies allow me to test the validity of the operational measures.

Table 22 shows the correlation coefficient, adjusted R-square between the used operational variable and the aimed financial variable. The operational and financial measures are taken from the 15 Finnish VCFs' replies. The results show that all of the operational measures of actual investments are highly correlated with the corresponding financial measures. These results support my method of giving equal weight to each portfolio investment.

However, stage index, which was based of the preferred stages stated by the VCFs, was used along with the other actual investment variables in the analyses. The reason for this was that the actual portfolio investment data did not give the stage of the portfolio company. I could have formed a construct based on sales and the number of employees in the portfolio company to proxy the stages of the Finnish portfolio companies. I chose not to do this, because I could not have been able to form a similar construct for the Israeli sample. Using stage index based on preferences for both sample countries ensured comparability between the samples. Using preferred stage index, in stead of actual stage index, is questionable when we see that the correlation between the preferred stage index and the financial stage index is considerably low. Hence, the results regarding venture stage index must be interpreted with caution.

Table 22 Results of validity tests of the operational constructs used in the study

Used variable	More precise variable	Correlation coefficient	Adjusted R^2	Aimed measure	Comment
Operational industry HHI	Financial industry HHI	,782**	,581	Degree of industry diversification	
Operational stage index	Financial stage index	,945**	,885	Median stage of portfolio investments	
Preferred stage index	Financial stage index	,368 sig.	,074		
Operational high-tech intensity	Financial high-tech intensity	,882**	,761	Share of capital invested in high-tech ventures	
Operational stage HHI	Financial stage HHI	,924**	,843	Degree of stage diversification	
Number of employees in the portfolio company		,59**		Venture stage of the portfolio company	Validated by Sapienza 1992*
Amount of Sales (million FIM)		,27*		Venture stage of the portfolio company	Validated by Sapienza 1992

Table 23 shows the explanation power of the preferred strategies on the actual investment behavior. The investment preferences correlate only partially with the actual investment data. This suggests that VCFs have thus far only partially been able to realize their intended strategies.

Table 23 Degree of realization of the intended strategies

Used variable	More precise variable	correlation coefficient	Adjusted R^2
Preferred industry diversification	Financial industry HHI	-,567* sig.	,270
Preferred stage index	Operational stage index	,491* sig.	,190
Preferred stage index	Financial stage index	,368 sig.	,074
Preferred stage diversification	Financial stage HHI	-,193 sig.	-,031
Preferred geographic scope	Operational geographic scope	,379 sig.	,105
Preferred industry diversification for the Israeli venture capital funds	Industry HHI	-,413 sig. ,006	,150

In cross-country studies, the problem of comparison emerges, because the selected samples might differ in important dimensions. The general characteristics of the two samples were compared using the non-parametric median test with Yates' continuity correction for two independent samples. Indeed, the results from these statistical tests suggested that the samples

differ in several dimensions. These differences were then used as possible explanations for the differences found in correlation analyses. After all, to study the differences relating to technology and government related money, was one of the objectives of this study.

The low number of cases and the relatively large number of missing data might have reduced the reliability of the results. However, this risk has been substantially reduced by excluding cases with missing values.

The variables, which measured of the degree of diversification relating to venture stage and industry were based on the Herfindahl-Hirschman index. This index does not take into account the covariance between the variables – for example the covariance between communication and biotechnology industries. As discussed earlier this covariance term is the dominant factor of portfolio risk management. A better construct might have been based on industry betas. Obtaining industry betas for small firms is likely to be difficult.

In conclusion, the reliability and validity of the results of the study can be judged satisfactory. Hence, generalization should be possible at least small technology based counties with relatively small venture capital markets.

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* Sapienza, H. When Do Venture Capitalists Add Value? *Journal of Business Vanturing*, volume 7. 1992. p 24. Venture stages used by Sapienza were coded as follows: 1=seed;2=start-up;3=first stage;4=re-start-up;5=expansion;6=bridge/aquisition.

8. DISCUSSION OF THE RESULTS AND PRESENTATION OF THE FINAL MODEL

8.1. SUMMARY OF THE TEST RESULTS OF THE HYPOTHESES

The exploration of the model that was proposed in chapter 5, produced only partial support for the hypotheses. Table 24 summarizes the hypotheses and the results from the empirical exploration. Below the table, Figure 39 and Figure 40 separately present the final models for the two sample countries. A dashed line represents partial support for the hypothesis.

Table 24 Summary of the test of Hypothesis

Hypothesis	**Empirical result Finland**	**Empirical result Israel**
H1a: Venture capital firms that invest mainly in early stage ventures will prefer investment opportunities within a more diverse set of industries than will other venture capital firms.	Support	
H1b: Venture capital firms that invest mainly in early stage ventures will prefer investment opportunities within a less diverse set of industries than will other venture capital firms.		Support
H2b: The venture capitalist's strategy to specialize in order to enhance their position in networks and information sharing flows will lead them to concentrate in one financing stage or several financing stages which may be related by virtue of subsequent follow-on investments.	weak support	Support
H3a: Venture capital firms that invest mainly in early stage ventures will prefer investment opportunities within a narrower geographic scope than will other venture capital firms.	No support on VCF level but support for the hypothesis on investment level	No support
H3b: Venture capital firms that invest within a less diverse set of industries will look for investment opportunities within a broader geographic scope than will other venture capital firms.	Support	Support
H4a: Venture Capital firm with a larger pool of capital under management will prefer venture investments within a more diverse set of industries than will other venture capital firms.	Support	weak support
H4b: Venture Capital firm with a larger pool of capital under management will prefer venture investments within a broader geographic scope than will other venture capital firms.	Support	Support
H5a: Venture capital firm with public sources of funds will prefer less diverse set of industries - focusing on high-tech industries - than will other venture capital firms.	Support	Not tested
H5b: Venture capital firm with public sources of funds will prefer more early stage ventures than will other venture capital firms.	Support	Not tested
H6a venture capital firms with more resources of capital have a lower propensity to syndicate than those venture capital firms with smaller capital resources do.	No support	No support
H6b venture capital firms with better availability of prospective investments have a lower propensity to syndicate	Not tested	Not tested
H7a venture capital firms within a more concentrated group, measured by capital invested, have a higher propensity to invest among themselves	Support	Support
H7b venture capital firms located in Helsinki/Tel Aviv have a higher degree of propensity to invest among themselves	Support	No support
H8a: venture capital firms focusing on early stage companies have a	No support on VCF level	No support

higher propensity to syndicate than those venture capital firms investing in more mature ventures do	but support in other direction on investment level	
H8b: venture capital firms focusing on high-tech companies have a higher propensity to syndicate than those venture capital firms investing in low-tech ventures do	Support	Support
H9: Sharing information is the most important reason for venture capital firms to syndicate	No support	Not tested

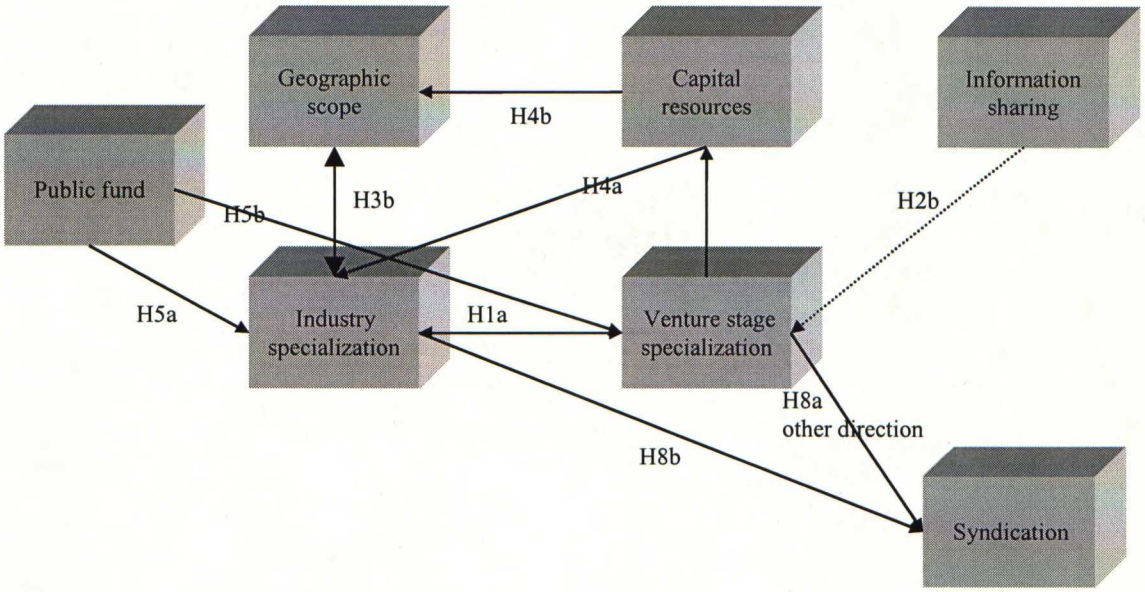

Figure 39 Final model for the Finnish venture capital industry

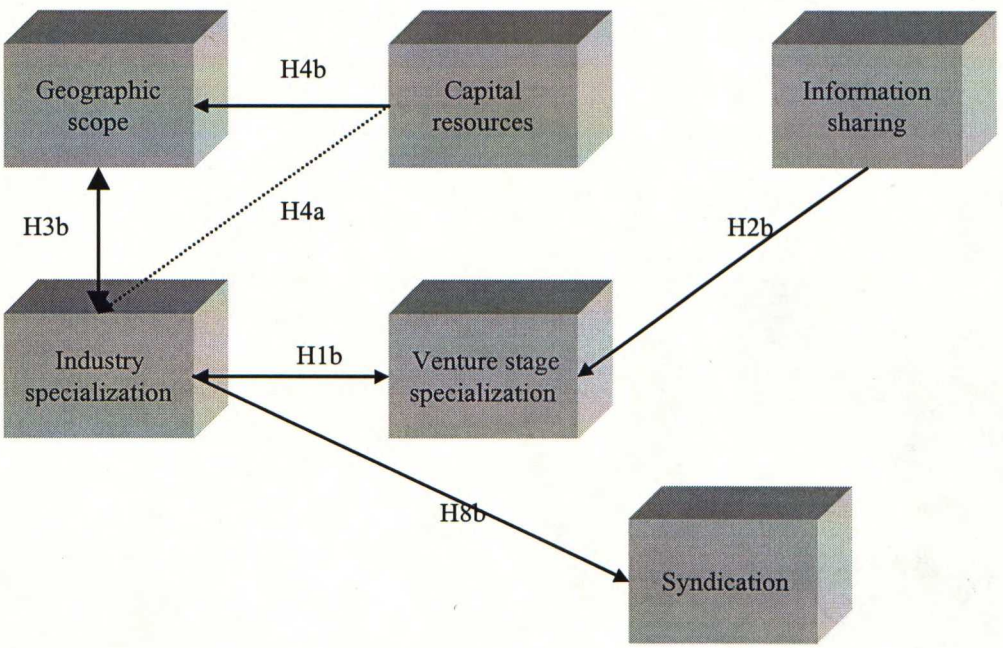

Figure 40 Final model for the Israeli venture capital industry

8.2. KEY FINDINGS OF THE RESEARCH

Five aspects of the results are remarkable. First, the Finnish VCFs investing in late stage ventures tend to be less industry diversified than those focusing on early stage. In Israel the opposite is true - Israeli VCFs investing in late stage ventures tend to be more industry diversified than those focusing on early stage. The Finnish result is in line with the portfolio theory's diversification hypothesis, whereas the Israeli result supports the specialization hypothesis. The most probable reasons for this distinctive difference relates to the difference in the level of high-tech ventures between the sample countries. The result suggests that the cost of gaining knowledge in high-tech industries is likely to be higher than in low-tech industries. Another interesting explanation relates to post-investment activities. It would seem that the Finnish VCFs focusing on early stage believe that they are not able to add sufficiently value to their portfolio companies, to compensate the additional risk associated with the early stage investment.

The second remarkable finding relates to the relationships between the industry, venture stage, and geographic diversification. First, the preferred geographic scope was found to be negatively related to the industry diversification in both countries. Second, the preferred geographic scope was found to be negatively related to the preferred venture stage diversification in Israel. Hence, industry and venture stage diversification seem to be substitutes for geographic scope. These relationships can be explained by the portfolio theory as well as by the VCF's need to find a sufficient amount of prospective ventures.

The third remarkable aspect is the relationship between uncertainty relating to venture stage and technology, and the propensity to syndicate. In Finland, regression analysis showed that late stage implied higher propensity to syndicate. Also, the Israeli data suggested a similar relationship, although the relationship was not significant. These results suggest that the additional risk associated with the large size of late stage investments more than offsets the risk associated with early stage investments. However, high-tech investment increased the propensity to syndicate even though the average investment size is less than in low-tech ventures. Both of these results can be explained by the portfolio theory and give support to the exchange resource model, which suggests that uncertainty should increase the degree of co-investing, other things equal.

The most important finding of this research relates to the quantitative and qualitative results of the link between diversification and syndication. The empirical results from the actual

investment data suggest that industry diversification, and venture stage diversification increase the propensity of syndication in both sample countries. Furthermore, the empirical results show that a broader geographic scope increases the propensity of syndication in Finland. Still, the empirical results give strong evidence that the number of portfolio companies is positively related to the propensity to syndicate in Israel.

The replies to the questionnaire further validate the empirical results between diversification and syndication. Israeli venture capitalists replies are highly consistent with the empirical results. They state that syndication is primarily used to diversify across companies, venture stages, industries, and geographic location, in this order. The first three reasons received empirical support. For the Finnish sample, the empirical results and venture capitalists replies are not as consistent. The Finnish venture capitalists state that syndication is primarily used to diversify across companies, geographic location, venture stages, and industries, in this order. The last three reasons receive empirical support, but the number of portfolio companies was not found to affect the propensity of syndication significantly.

In summary the results suggest that VCFs' desire to diversify their portfolios drives syndication. Because syndication enables VCFs to diversify their portfolios, those VCFs wanting to diversify are likely to increase their level of syndication. As a result of the higher propensity to syndicate these VCFs become well-diversified. Because the degree of diversification is a measure from a certain point in time, but the syndications have emerged during a long period of time, it is impossible, based on the empirical results, to say whether VCFs that have well-diversified portfolios still have a higher propensity to syndicate. The result only tell us that those VCFs that have had a higher propensity to syndicate also have become diversified. The relationships between syndication and diversification are presented in a figure shown in Appendix 5.

The fifth and final remarkable result relates to public funds. Public funds in Finland seemed to behave as expected. Public VCFs tend to invest in early high-tech ventures. Public VCFs were also found to be more locally oriented than private VCFs. Because public VCFs may have additional investment criteria to the risk-return criteria used by private VCFs, public venture capital may result in overvaluing early high-tech companies. This possible overvaluing is likely to lead private VCFs to invest in late low-tech firms, where the risk-adjusted return is higher. On the other hand, private venture capitalists may simply prefer later stage ventures because of their familiarity with financial issues.

8.3. OTHER FINDINGS OF THE RESEARCH

The circular model of diversification received support in Finland, except for the unexpected relationship between the venture stage and the industry diversification discussed above. In Israel, all correlation coefficients were in the expected directions, except for the relationship between the venture stage index and the preferred geographic scope. However, one should remember that the latter relationship was insignificant also in Finland at the VCF level, but a statistically significant positive relationship was found between the number of employees in the portfolio company, and the portfolio company's proximity to the VCF's office. This result suggests that early stage ventures tend to be closer to the VCFs office than late stage ventures, as hypothesized. The most apparent reason for this is that early stage ventures require more face-to-face assistance, which makes proximity desirable. Unfortunately I was unable to test this hypothesis at the investment level in Israel.

The results relating to the uncertainty and syndication were discussed above. Concentration would also seem to affect the level of syndication. In both countries VCFs, which had invested large amounts of capital, preferred to co-invest among themselves and also had a higher overall propensity to syndicate. Moreover, the concentration of VCFs' offices in the Helsinki area seemed to affect syndication patterns in Finland.

The results relating to munificence were contradictory. Empirical results suggested that capital resources were, contrary to expectations, positively related to the propensity to syndicate in Israel. I was unable to empirically test how the munificence of deal flow affects the propensity of syndication. On the other hand, the replies to the questionnaire gave strong support in favor of the resource exchange model. The VCFs in both sample countries stated that capital limitation were the primary financial reason for them to syndicate. In addition, sharing deal flow ranked as second in Finland, and third in Israel in order of importance regarding information sharing. In conclusion, due to the problems of forming valid constructs to measure the scarcity of capital resources empirically, I will interpret these results as in favor of the munificence hypothesis. Thus, all three variables of the resource exchange model - munificence, uncertainty, and concentration - received variable degrees of support. In conclusion, the results suggests that the resource exchange model seems to be an appropriate model in explaining syndication patterns.

Israeli VCFs have a substantially higher propensity to syndicate and connectedness than their Finnish counter-partners. The most apparent explanation why the overall connectedness

differs between the sample countries relates to the technology intensity of the venture capital industries and to the size of the countries. First, high technology was found to increase the likelihood of syndication. Second, as discussed, proximity seems to affect connectedness. For example, Bygrave found that the venture capitalists in California had a greater propensity to invest among themselves than with out-of-state venture capitalists. Third, the results show that Israeli VCFs focusing on early stage ventures syndicate often with VCFs that specialize in late stages. This finding suggests that the dynamics of round financing is likely to take place in Israel. It follows, that because Israel has relatively more early high-tech investment and it is geographically smaller than Finland, Israel also has a higher overall propensity to syndicate.

Finally, the amount of capital under management was positively related to industry diversification and geographic scope. Moreover, the actual industry diversification had a stronger correlation with the amount of capital under management than the preferred industry diversification. This phenomenon can be explained by the VCF's need to receive a sufficient amount of deal flow. A VCF may be tempted to invest in outside of its original investment scope, if the capital available for investments is too high in relation to the deal flow available from its original investment scope.

9. CONCLUSIONS

Previous research has illustrated that high uncertainty and the rather long time horizon of venture capital investments makes managing financial risk crucial for venture capital firms' performance[127]. Finance theory suggests that portfolio diversification should be especially beneficial for venture capital firms operating in such an uncertain environment, yet many venture capital firms hold poorly diversified portfolios. Moreover, although co-investments are common practice among different venture capital firms, little research has been conducted on them.

Previous research has studied venture capital firms' diversification characteristics and how the uncertainty related to early venture stage, industry, and technology affect the venture capital firms' propensity to syndicate. However, a related issue of if and how diversification affects syndication has not been studied.

The purpose of this study was twofold. First, to analyze the extent to which Finnish and Israeli venture capital firms diversify their portfolios, and to identify the most important factors, which affect the degree of diversification. Second, to measure the extent of syndication among Finnish and Israeli venture capital firms, and to identify the most important reasons for the existence of syndication. The most important contribution of this study relates to the evaluation of how diversification and syndication are interrelated.

I formed the circular model of diversification and its hypotheses on the basis of previous research from US venture capital industry. I used both VCFs investment preferences and data from actual portfolio investments to test the hypotheses. To study the degree of syndication, I formed variables based on the resource exchange model of Pfeffer[128]. The empirical part of the thesis consisted of analyzing the correlation, chi-square, and regression tests on these variables.

9.1. RESULTS

My findings relating to the circular model of diversification were mostly consistent with the previous findings from US, except for the negative relationship between the venture stage index and the industry diversification in Finland. The most probable reasons for this is the

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[127] Norton, E, Tenenbaum, B.H. 1993. Specialization versus Diversification as a Venture Capital Investment Strategy. *Journal of Business Venturing,* 8. p 432

difference in the level of high-tech ventures between the sample countries. The result suggests that the cost of gaining knowledge in high-tech industries is likely to be higher than in low-tech industries. Other explanations relate to the lack of Finnish VCFs focusing on early stage ventures, and to the lack of capabilities to add value in the portfolio companies.

A new relationship was found between the industry diversification and the geographic scope. The results indicate that those VCFs specializing in certain industries would tend to look for portfolio companies within a broader geographic scope than those with highly industry-diversified portfolios. This relationship was statistically significant in both sample countries. In addition, venture stage diversification was found to act as a substitute for the geographic scope in Israel. According to a multiple linear regression model, the circular model of diversification explained approximately 55 percent of the variance in the actual industry diversification in both sample countries.

The exchange resource model appears to explain relatively well syndication patterns. All three variables of the resource exchange model - munificence, uncertainty, and concentration - received variable degrees of support. First, the uncertainty relating to high-tech ventures significantly increased the probability of the investment being syndicated. Second, according to the venture capitalists' replies to my questionnaire, munificence would seem to be the primary financial reason for VCFs to syndicate. In addition, sharing deal flow ranked as second in Finland and as third in Israel in order of importance regarding information sharing. Third, concentration would appear to affect the degree of syndication. For example VCFs, which had invested large amounts of capital, preferred to co-invest among themselves, and also had a higher overall propensity to syndicate in the both sample countries.

The most important finding of this research relates to the quantitative and qualitative results of the link between diversification and syndication. The empirical results from the actual investment data suggest that industry diversification, and venture stage diversification increase the propensity of syndication in both sample countries. The replies to the questionnaire further validate the empirical results between diversification and syndication. In summary the results suggest that VCFs' desire to diversify their portfolios increases the propensity to syndicate. As a result of the higher propensity to syndicate VCFs become well-

[128] Pfeffer, J; Salancik, G.R. 1978. The External Control of Organizations. Harper & Row. New York.

diversified. Venture capitalists state that syndication is primarily used to diversify across companies, and venture stages.

Finally, public funds in Finland seemed to behave as expected. Public VCFs tend to invest in early high-tech ventures. Public VCFs were also found to be more locally oriented than private VCFs.

9.2. *PREVIOUS RESEARCH*

The initial circular model was mainly formed from previous research. The model received strong support. My contributions to this field of study relate to the founding of a negative relationship between the industry diversification and the geographic scope. In addition, my results suggested that industry diversification and venture stage diversification are more likely to be substitutes for geographic scope. These new findings are both in line with the portfolio theory.

Bygrave tested the exchange resource model in US and received support. He found that high-tech and early stage implied syndication, although the investment sizes were less than in late or low-tech ventures. Bygrave went as far as to argue that the primary reason for VCFs to syndicate is to share information, not to spread financial risk.[129] Interestingly, my findings indicated that late stage and high-technology implied syndication in Finland, and similar results were found in Israel. All of these results can be explained with the portfolio theory. This point was ignored in Bygrave (1987). I used a questionnaire to contribute to the debate of the dominant factor for syndication. The results from the questionnaire suggest that spreading of financial risk is an equally important factor as sharing of information.

9.3. *IMPLICATIONS*

IMPLICATIONS FOR THE FINNISH VENTURE CAPITAL FIRMS

Finnish VCFs industry is at the moment quite concentrated in terms of their preferences regarding industry diversification and the venture stage index. 73 percent of the Finnish VCFs have no industry preferences and 80 percent are concentrating on rather late stages. The corresponding percents from Israel are only 23 and 55. Moreover, the share of capital invested in high-tech industries in Israel is three times that in Finland. Hence, I would expect that in

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[129] Bygrave, W. 1987. Syndicated investments by venture capital firms: a network perspective. *Journal of Business Venturing,* volume 2. p 151

the future there will be more Finnish VCFs specializing in certain industries, especially high-tech industries, and in early stage ventures. There certainly would seem to be room in the industry for such VCFs. More restricted investment strategies would also help institutional investors, such as pension fund managers, to diversify their own portfolios. When VCFs have well-stated and distinct investment strategies, institutional investors can manage risk better.

In addition, the level of connectedness in Finland is significantly less than that in US or in Israel. This is likely to be due to the lower level of early high-tech investments in Finland. Although syndication enables a VCF to diversify its portfolio, it may make portfolio diversification more difficult for an institutional investor. An institutional investor may believe he has diversified his venture capital funds by investing in several different funds. If these funds syndicate often the end result may be that the institutional investor winds up having his money in the same portfolio companies. It follows that from institutional investors' point of view, a more desirable reason for the existence of syndication is likely to be the sharing of information. According to the questionnaire Israeli venture capitalists appreciated the information sharing relatively more than their Finnish counter-partners. It follows, that the Finnish VCFs are advised to search for syndications that not only spread financial risk, but also share information.

Information sharing is also likely to enhance the VCFs' potential to add value. First, venture capitalists believe that syndication helps them build a network. This network may bring venture capitalists and entrepreneurs together more efficiently than what otherwise would happen. Second, at least venture capitalists tend to believe that two investors from different VCFs can make superior investment decisions. Finally, syndication may help combining different competencies from different VCFs to provide a portfolio company with non-financial assistance that improve the risk-return mix of the portfolio.

IMPLICATIONS FOR INSTITUTIONAL INVESTORS

While syndication itself is likely to benefit institutional investors, syndications among the funds in which a given institutional investor has invested are problematic from the institutional investors' point of view. Because syndication may make risk management more difficult for institutional investors, they should try to limit the probability of having their money being invested in the same portfolio companies by different funds they have invested in. Institutional investors are advised to invest in funds that not only have transparent investment policy regarding diversification but also have transparent policy regarding

syndications. If the information on the funds' syndication patterns is not available, institutional investor could limit the probability of undesired syndications by investing in funds in different groups that have a low degree of intergroup syndication. For example, in Finland venture stage seemed to divide the VCFs into two groups that preferred to syndicate intragroup, that is among other VCFs in their group. By investing in one fund in each group the institutional investor would increase the likelihood of having his money being invested in different ventures.

The amount of capital under management was found to be positively related to industry diversification and geographic scope. A VCF may be tempted to invest in companies outside of its original investment scope, if the capital available for investments is high in relation to the deal flow available from its original investment scope. Institutional investors are advised to evaluate the availability of the deal flow in the fund's investment scope before they decide the amount of money they want to invest in the fund. Too much money in relation to the deal flow is likely to result in portfolio investments outside the intended investment scope.

9.4. LIMITATIONS

One weakness in this study arises from the lack of VCFs in Finland and in Israel. Although the response rate to my questionnaire itself was considerably high, the absolute number of replies forced me to use operational variables, which give equal weights to every investment, instead of financial measures. Correlation analysis fortunately revealed that operational measures were highly valid to explain financial measures. The obtained results are thus based on operational variables, and may to some extent be biased.

The variables, which measured of the degree of industry-diversification was based on the Herfindahl-Hirschman index, which does not take into account the systematic risk of the industries. A better construct might have been based on industry betas.

9.5. SUGGESTIONS FOR FURTHER STUDY

Many venture capital firms tend to specialize in certain industry or venture stage. A specialization strategy implies that these venture capital firms believe they are able to add value in their portfolio companies. Is this belief true?

As we know, many mutual funds also specialize and believe they can pick under-priced stocks and forecast the future market trend. However, the empirical evidence suggests stock markets are so efficient that investors would be better off if they would invest their money in index

funds with low costs. Does the same apply to the venture capital market? Can specialized funds add sufficient amount of value in order to beat the well-diversified portfolios? It would be interesting to know whether the risk adjusted returns from specialized venture capital funds have over-performed the diversified funds or not.

Syndication is a common practice in the venture capital industry. More research attention should be given to it. The critical question remains, whether the dominant factor in syndication is the spreading of financial risk or the sharing of information.

This research focused on the VCFs and institutional investors' point of view on syndication. Research on what the benefits of syndication are to each party involved - the entrepreneur, the VCF, and the institutional investor - deserves more emphasis. It would be interesting to know if and how VCFs' syndication and diversification strategies relate to their post-investment activities.

All previous researches on syndication have ignored the actual size of the portfolio investments. A more detailed analysis on the risk associated with the investment size, venture stage and high-tech is needed in order to separate their relative importance to syndication.

Finally, this study was unable to empirically test the effect of munificence on syndication, and further research is needed on the topic. Both the sharing of deal flow and capital constraints ranked high in the venture capitalists' replies, which suggests that munificence appears to be the most important factor of the resource exchange model affecting syndication. A longitudinal study is required to more reliably measure if and how capital resources determine the degree of syndication. Similarly, the question of how the flow of prospective deals affects the level of syndication, requires further attention.*

Studying how and why venture capital firms diversify and co-invest is likely to bring more light to financial risk management. After all, because venture capital involves high

* Aside from the further exploration of the results, the data collected for the present study also seem suitable for other analyses. One potential further investigation road might be an analysis of the relationship between the intended investment strategies and the actual investment behavior of venture capital firms.

uncertainty, asymmetries of information, and outstanding opportunities of return, it gives us an opportunity to study modern financial theory in a setting of extremes [130].

[130] Barry, C. 1994. New Directions in Research on Venture Capital Finance. *Financial Management, v*olume 23, 3. p3

REFERENCES

Admati, A.R. & Pfleiderer, "Robust Financial Contracting and the Role of Venture Capitalists", Journal of Finance, June 1994, pp. 371-402

Alho, K. Jutila & E. "Venture Capital Funds in the Development of Technology Windows and New Business Ventures of Corporations". Helsinki University of Technology. 1991.

Barney, J & Busenitz, L & Fiet, J & Moesel, D. "New Venture Teams' Assessment of Learning Assistance from Venture Capital Firms" Journal of Business Venturing. 1996. pp 257-271

Barry, C. "New Directions in Research on Venture Capital Finance". Financial Management. Vol 23:3. Autumn 1994. pp 3-15

Borg, P. "Ammattimainen pääoma sijoittaminen Suomessa 1996". Finnish Venturing Association ry. 1997

Borg, P. "Ammattimainen pääoma sijoittaminen Suomessa 1997". Finnish Venturing Association ry. 1998

Bruno, A.V. & Tyebjee, T.T. "The One that Got away: A Study of Ventures Rejected by Venture Capitalists" Frontiers of Entrepreneurship Research. 1983. Babson College. Pp. 289-306

BVCA . 1996. Press release: Independent venture capital funds increase returns to investors. London. British Venture Capital Association.

Bygrave, W & Timmons, J. "Venture Capital at the Crossroads". Harvard Business School Press. Boston. 1992

Bygrave, W. "The Structure of the Investment Networks of Venture Capital Firms", Journal of Business Venturing, vol.3 no. 2. 1988, pp. 137-158

Bygrave,"Syndicated investments by venture capital firms: a network perspective". Journal of Business venturing. 1987 Vol. 2. pp.139-154

Carmines, E. & Zeller, J. Reliability and validity. 1979. Sage, Newbury Park.

Coopers & Lybrand Corporate Finance. "The Economic Impact of venture Capital in Europe". European Venture Capital Association. 1996

Ehrlich, S & Noble, A & Moore, T & Weaver, R. "After the Cash Arrives: A Comparative Study of Venture Capital and Private Investor Involvement in Entrepreneurial Firms". Journal of Business Venturing. 1994:9. pp 67-82

Elango, B. Fried, V. H. Hisrich, R.D. Polonchek, A. "How Venture Capital Firms Differ". Journal of Business Venturing 10, 1995, pp. 157-179

Eun, C. S. & Resnick, B. G. "Estimating the Correlations Structure of International Share Prices", The Journal of Finance, December 1984, pp. 1311-1324.

Fiet, J. "Risk Avoidance Strategies in Venture Capital Markets". Journal of Management Studies 32:4, July 1995, pp. 551-574

Finnish Venturing Association ry. "Ammattimainen pääoma sijoittaminen Suomessa 1995". 1996

Flynn, D. "A Preliminary Examination of Organizational and other Factors Affecting Performance in the New Ventures: the View of the Venture Capitalists". Entrepreunership & Regional Development. Vol. 7. 1995. pp 1-20

Frank, H & Plaschka, G. "Plamming Behaviour of Successful and non-successful founders of new ventures". Entrepreneurship and Regional Development. 1989:1. pp 191-206

Fried, V, Hisrich, R. 1994. "Toward a Model of Venture Capital Investment Decision Making". Financial Management. Vol. 23(3). Autumn 194. Pp. 28-37

Ghauri, P, Gronhaug, K, Kristianlund, I. "Research Methods in Business Studies". 1995. Prentice Hall. New York

Gifford, S. "Limited Attention and the Role of the Venture Capitalist". Journal of Business Venturing. 1997. Vol. 12. pp 459-482

Gorman, M & Sahlman, W. "What Do Venture Capitalists Do?". Journal of Business Venturing. 1986:4. pp 231-248

Gupta, A. K. & Sapienza, H. "Determinants of Venture Capital Firms' Preferences Regarding the Industry Diversity and Geographic Scope of Their Investments" Journal of Business Venturing. 1992:7. Pp. 347-362

Haavisto, T; Hansson, B. "Risk Reduction by Diversification in the Nordic Stock Markets", Scandinavian Journal of Economics. Vol. 94, No. 4, 1992, pp. 581-588

Harvard Business School. "A method for valuing high-risk, long-term investments", teaching note, 9-288-006, 1987, pp. 1-61

Israel Venture Association. "IVA 1998 Yearbook". 1998. Edited by Giza Group.

Jänkälä, P. "Ammattimainen pääoma sijoittaminen Suomessa 1993". Finnish Venturing Association ry. 1994

Jänkälä, P. "Ammattimainen pääoma sijoittaminen Suomessa 1994". Finnish Venturing Association ry. 1995

Jänkälä, P. "Venture Capital –toimiala Suomessa vuonna 1992". Finnish Venturing Association ry. 1993

Korhonen, J. "The SME Policy Programme 1996 in Finland". Ministry of Trade and Industry, Finland Standing Committee reports. 3/1996.

Larson, A. "Network Dyads in entrepreneurial settings: A study of the governance of exchange relationship". Administrative Science Quarterly, March 1992, Vol. 37. pp.76-104

Lerner, J. "The Syndication of Venture Capital Investments". Financial Management, Vol. 23, No. 3, Autumn 1994, pp. 16-27

Lerner, J. "Venture Capitalists and the Oversight of Private Firms". The Journal of Finance. 1995. Vol L:1. pp 301-318

Levy, H. "Possible Explanations of non-synergy merger and small firm effect by the generalized CAPM" Review of Quantitative Finance and Accounting. 1991, 1(1):101-128

Liljeblom, E. & Löflund, A. & Krokfors, S. "The Benefits from International Diversification for Nordic Investors". Svenska handelshögskolan working papers, No. 295, 1995

Lumme, A, Mason, C, Suomi, M. 1998. "Informal Venture Capital: Investors, Investments and Policy Issues in Finland". Kluver Academic Publishers. Boston

MacMillan, I. C. & Kulow, D. M. & Khoylian, R. "Venture Capitalists involvement in their investments: extent and performance". Journal of Business Venturing. 1988. Vol. 4. pp 27-47

Markowitz, H. 1952. "Portfolio Selection". The Journal of Finance. March 1992. pp. 77-91

Merton, R. "A Simple Model of Capital Market Equilibrium with Incomplete Information". Journal of Finance. 1987, 42(3):483-510

Mitchell, F & Reid, G & Terry, N. "Post Investment Demand for Accounting Information by Venture Capitalists". Accounting and Business Research. Summer 1995. Vol 25:99. pp 186-196

Norton, E. & Tenenbaum, B.H. "Specialization versus Diversification as a Venture Capital Investment Strategy". Journal of Business Venturing. 1993:8. Pp. 431-442

Nunnally, J. Psychometric theory. 1967. McGraw Hill, New York

Pfeffer, J. & Salancik, G.R. "The External Control of Organizations" New Your: Harper & Row, 1978

Pyykkö, S. "Venture Capital Funding and Telecommunications Industry: A Case Study of the Venture Capitalists That Invest in Telecommunications in the UK and in France". Master Thesis Helsinki School of Economics and Business Administration. 1994.

Relander, K-E. "Venture capital -toiminta ja kansainvälistyvä pkt-yritys". SITRA publications, Series B, Number 97. 1989.

Rosenstein, J. Bruno & A. Bygrave, W. & Taylor, N. "The CEO, Venture Capitalists, and the Board". Journal of Business Venturing. 1993:8. pp 99-113

Ross, S. "The Arbitrage Theory of Capital Asset Pricing". Journal of Economic Theory, December 1976, pp.343-362

Sah, R, K, Stiglitz, J,E. "The Architecture of Economic Systems: Hierarchies and Polyarchies" American Economic Review, September 1986, pp. 716-727

Sahlman, W. "The Structure and Governance of Venture Capital Organizations" Journal of Financial Economics, October 1990:27, pp. 473-521

Sandtler, D. "How Venture Capitalists Add Value". Journal of General Management. Autumn 1993. Vol 19:1. pp 1-15

Sapienza, H & Manigart, S & Vermeir, W. "Venture Capitalists Governance and Value Added in Four Countries". Journal of Business Venturing. 1996:11. pp 439-469

Sapienza, H. "When Do Venture Capitalists Add Value?". Journal of Business Venturing. 1992:7. pp 9-27

Sapienza, H; Amason, A; Manigart, S. 1994. "The Level and Nature of Venture Capitalist Involvement in Their Portfolio Companies: A Study of Three European Countires". Managerial Finance. Volume 20(1). Pp.3-18

Shapiro, Alan. C. Multinational Financial Management. 5th edition. Prentice Hall International Editions. 1996.

Sharpe, W. F. "Decentralized investment management" Journal of Finance, May 1981, Vol. 36:2, pp. 217-234

Sharpe, W.F. "Capital Asset Prices: A Theory of Market Equilibrium under Conditions of Risk". Journal of Finance, 1964, pp. 425-442

Steier, R & Greenwood, R. "Venture Capitalist Relationship in the Deal Structuring and Post-investment Stages of New Firm Creation" Journal of Management Studies. May 1995. pp. 337-357

Timmons, J. A. & Bygrave, W. D. "Venture capital's role in financing innovations for economic growth". Journal of Business Venturing. 1986. Vol.1. pp 161-176

Timmons, J. New Venture Creation. Irwin. 1994.

Turunen, H. "Teknologian yritysten rahoitus". Master's Thesis Helsinki School of Economics and Business Administration. 1995.

Tyebjee, T. T. & Bruno, A. V. "A model of venture capitalist investment activity". Management Science. 1984. Vol. 30:9. pp 1051-1065

INTERVIEWS

Aaltonen, Jukka. Director, Sitra. 1998-04-20

Kurkijärvi, Kalevi. Partner, Sitra Biofund Management Oy, 1998-09-10

Lumme, Annareetta. Partner, SFK Finance Oy. 1998-08-14

Naukkarinen, Arto. Director. OKO-Venture Capital. 1998-04-24

Petäjistö, Jorma. President. Helmet Capital Fund Management Oy. 1998-04-20

Sapienza, Harry. Professor, University of South Carolina. 1998-09-10 and 1998-09-11

Suomela, Juhani. Managing Director. MB Corporate Finance Ltd. 1998-04-24

Suonenlahti, Mikko-Jussi. Director. SFK Finance Oy. 1998-04-23

Söderlund, Torleif. Director. Merita Capital Oy. 1998-04-20

Vanha-Honko, Vesa. Director. Capman Capital Management Oy. 1998-04-29

SEMINARS

Helomaa, Jouko. Managing Director. Merita Capital Oy. Dipoli, Espoo. 1998-03-17

Relander, Kaj-Erik. Helsinki School of Economics and Business Administration. 1998-04-01.

Appendix 1

All of the questions in this questionnaire are related to your current portfolio companies. Those companies you have exited from should be excluded

Total number of syndicated investments where the lead investor		#
Approximately the number of first round syndications		#
Approximately the number of later round syndications		#
Approximately the number of syndication proposals you have received		#
Approximately the number of investment proposals per one investment		#
Number of syndications among different funds within your management company		#
Number of syndications with foreign venture capital firms		#
Total amount of syndicated investments		FIM millions

PLEASE READ THE FOLLOWING STATEMENTS AND MARK YOUR AGREEMENT (1 to 5)

1 = does not affect our decision to syndicate

5 = I strongly agree

WE SYNDICATE WITH OTHER VENTURE CAPITAL FIRMS (VCFs) BECAUSE...	
syndication allows us to participate in larger deals (e.g. fund limits, minority holding rule..)	1 2 3 4 5
syndication enables us to obtain future deal flow from the syndicated partners	1 2 3 4 5
syndication enables us to invest in greater number of different industries	1 2 3 4 5
syndication enables us to invest in a greater number of different venture stages	1 2 3 4 5
syndication enables us to invest in companies within a broader geographic scope	1 2 3 4 5
syndication is a means to reduce company specific risk because it allows us to invest in greater number of companies	1 2 3 4 5
syndication helps us building industry specific networks and contacts	1 2 3 4 5
two venture capitalists from different VCFs can make a better investment decision than just one	1 2 3 4 5
we want to be part of the success stories and therefore make later round syndicated investments in well performing companies	1 2 3 4 5
amount of work needed to evaluate the proposal and to assist the company personally.	1 2 3 4 5
syndication has public relations value because we want our company name to be attached to as many deals as possible	1 2 3 4 5
Other	1 2 3 4 5

FUTURE TREND OF SYNDICATION

Do you see that the proportional amount of syndication (=number of syndicated investment divided by the total number of investments) in your company is going to decrease or increase in the future, and with what types of VCFs (range:+2 - -2, where +2 indicates strong increase in syndication; +1= slight increase; 0= current level; -1 slight decrease, and -2 strong decrease in syndication)

	Finnish VCFs	Foreign VCFs
number of syndications with larger venture capitalists (measured by capital under management)	+2 +1 0 -1 -2	+2 +1 0 -1 -2
number of syndications with similar size venture capitalist (measured by capital under management)	+2 +1 0 -1 -2	+2 +1 0 -1 -2
number of syndications with smaller venture capitalists (measured by capital under management)	+2 +1 0 -1 -2	+2 +1 0 -1 -2
number of syndications with venture capitalists with different industry focus	+2 +1 0 -1 -2	+2 +1 0 -1 -2
number of syndications with venture capitalists with similar industry focus	+2 +1 0 -1 -2	+2 +1 0 -1 -2
number of syndications with venture capitalists with different venture stage focus	+2 +1 0 -1 -2	+2 +1 0 -1 -2
number of syndications with venture capitalists with similar venture stage focus	+2 +1 0 -1 -2	+2 +1 0 -1 -2

We do not syndicate because....

Appendix 1

All of the questions in this questionnaire are related to your current portfolio companies. Those companies you have exited from should be excluded

Name of the management company		
Capital under management		FIM millions
Capital invested		FIM millions
Number of years the management company has been in venture capital business		#
Number of people currently responsible for monitoring portfolio investments		#
Number of portfolio investments for which typical individual is currently responsible		#
Number of boards of directors on which typical individual serves		#
Number of portfolio companies altogether		#

Number of portfolio companies and approximately the percentage of capital invested in the following venture stages

	Capital invested %	Number of portfolio companies
Seed		
Start-up		
Other early stage		
Expansion		
Bridge financing		
MBO/MBI		
Turnaround		
Total	**100 %**	

Number of portfolio companies and approximately the percentage of capital invested in the following industries

	Capital invested %	Number of portfolio companies
Agriculture		
Biotechnology		
Chemicals and materials		
Communications		
Computer related		
Construction		
Consumer related		
Energy		
Environment protection		
Financial services		
Forrest industry		
Industrial automation and control		
Industrial products and services		
Medical/health related		
Other electronics related		
Other manufacturing		
Other services		
Transportation		
Turism		
Other		
Total	**100 %**	

	Apax-Leumi Partners Ltd.	Arie Razel Devel. & Mgt. (1992) Ltd.	Clal Venture Capital Management Ltd.	Clalit Capital & Investments Ltd.	Comverse Investments Ltd.	D.C.L. Technologies Ltd.	DS Polaris Ltd.	Eurofund L.P.	Evergreen Canada Israel Investments Ltd.	Gemini Capital Fund Management Ltd.	Integrated Technologies of Israel Ltd.	Interface Group - Israel	Inventech Investment Co. Ltd.	Israel R&D Corporation Ltd.	IsraTech Management Company	Jerusalem Venture Partners Mgt. (Oxton)	Kardan Venture Partners Ltd.	Marathaon Venture Capital Fund Ltd.	Medica Venture Partners	Medmax Ventures LLC
Apax-Leumi Partners Ltd.								1	2	4						1				1
Arie Razel Devel. & Mgt. (1992) Ltd.				1					1											
Clal Venture Capital Management Ltd.		1			2		2	1	4	5						2				
Clalit Capital & Investments Ltd.				2			1	1					1			2			1	
Comverse Investments Ltd.													1							
D.C.L. Technologies Ltd.									1							1				
DS Polaris Ltd.				2	1			1	3	2						1	1		1	1
Eurofund L.P.	1			1	1			1	2	8			3							
Evergreen Canada Israel Investments Ltd.	2	1		4			1	3	2	5			2				1		1	
Gemini Capital Fund Management Ltd.	4			5				2	8	5			3			3	1		1	2
Integrated Technologies of Israel Ltd.																				
Interface Group - Israel																				
Inventech Investment Co. Ltd.					1	1			3	2	3			2				1	1	
Israel R&D Corporation Ltd.													2							
IsraTech Management Company																				
Jerusalem Venture Partners Mgt. (Oxton)	1			2	2		1	1			3									
Kardan Venture Partners Ltd.								1		1	1									
Marathaon Venture Capital Fund Ltd.													1							
Medica Venture Partners					1			1		1	1		1							1
Medmax Ventures LLC	1							1			2								1	
Mezzanine Investors Ltd.																				
Millennium Materials Fund Management				1											1					
Mofet Venture Capital Fund Mgt. (1992) Ltd.	1	1		5	3			1	2	8	5					5		1		
Neurone Investment Management Ltd.																				
Nitzanim High Tech. Industrial Mgt.				1					2	4	4		2				1	1	2	1
Ofer Technologies Ltd.																				
Quantum Investment Company Ltd.				1	1			1		3	1		2	1					1	
Rafael Development Corporation (RDC) Ltd.				1		1				2	1									
SBRC Investment Consultation Ltd.									2		1		2	1					1	
Seed Management Associates	3								1											
Shirat Enterprises Ltd.		1		2									1							
Steps (Tzeadim) Investments in Technology Ltd.				2	1					2	1					1	2			
SVM Star Ventures Capital Management	2			5	5		1	1		7	5		2			8	1			1
Technorov Holdings (1993) Ltd.	1				2		2	3	1	1			1	1		1		1	1	
Teuza Management and Development Ltd.											1		1					1		
Trinet Investment in High-Tech Ltd.				1						3	1		1	1						
Vectory Investment Company Ltd.																				
Venture Fund Vertex Management (III) Ltd.	2			1					1	2	4									1
Veritas Venture Capital Management Ltd.									3	1	5		1				1			1
Walden Israel Ltd.	3			1				2		3	7		1	1					1	2
Y.L.R. Investment Management Ltd.	1			1	1			1		1	1		1			1		3		
YVC - Yozma Mgt. & Inv. Ltd.																		1	1	1
Zannex Capital Management (Israel) Ltd.						1							1							
TOTALS	**22**	**4**	**39**	**21**	**3**	**5**	**22**	**29**	**59**	**71**	**0**	**1**	**30**	**7**	**1**	**26**	**8**	**9**	**13**	**12**

Mezzanine Investors Ltd.	Millennium Materials Fund Management	Mofet Venture Capital Fund Mgt. (1992) Ltd.	Neurone Investment Management Ltd.	Nitzanim High Tech. Industrial Mgt.	Ofer Technologies Ltd.	Quantum Investment Company Ltd.	Rafael Development Corporation (RDC) Ltd.	SBRC Investment Consultation Ltd.	Seed Management Associates	Shirat Enterprises Ltd.	Steps (Tzeadim) Investments in Technology Ltd.	SVM Star Ventures Capital Management	Technorov Holdings (1993) Ltd.	Teuza Management and Development Ltd.	Trinet Investment in High-Tech Ltd.	Vectory Investment Company Ltd.	Venture Fund Vertex Management (III) Ltd.	Veritas Venture Capital Management Ltd.	Walden Israel Ltd.	Y.L.R. Investment Management Ltd.	YVC - Yozma Mgt. & Inv. Ltd.	Zannex Capital Management (Israel) Ltd.	TOTALS
			1						3				2	1				2		3	1			22
			1								1													4
		1	5		1		1	1			2	2	5			1		1		1	1			39
			3				1					1	5	2							1			21
								1															1	3
													1	2										5
			1				1						1	3						2	1			22
			2		2				2	1				1				1	3					29
			8		4		3	2				2	7	1		3		2	1	3	1			59
			5		4		1	1	1			1	5		1	1		4	5	7	1			71
																								0
										1														1
					2		2		2		1		2	1	1	1			1	1	1		1	30
							1		1					1		1				1				7
		1																						1
			5									1	8	1							1			26
					1							2	1						1					8
			1		1									1	1						3	1		9
					2		1		1					1						1		1		13
					1								1					1	1	2		1		12
																								0
																								2
					1		4	2			1		9	1	1	1		3		6				61
																								0
			1				1					2	1		1				3	1				28
																								0
			4		1				1	1			4	2		1				3	1			29
			2										1		1			1		1				11
							1							1		1				1				11
							1						2	1				1		1				11
			1																			1		6
					2								2		1	1		1	2					18
			9		1		4	1		2		2		1					1	2	1	1		63
			1				2		1	1			1			1				1	1			24
			1		1			1				1					1	1			1			10
			1				1		1			1		1					1	1				14
															1									1
			3					1		1		1			1				1	1				20
					3							2	1			1		1		2				22
			6		1		3	1	1	1			2	1		1		1	2					41
							1						1	1	1							1		16
											1		1								1			6
																								2
0	**2**	**61**	**0**	**28**	**0**	**29**	**11**	**11**	**11**	**6**	**18**	**63**	**24**	**10**	**14**	**1**	**20**	**22**	**41**	**16**	**6**	**2**	**778**

Appendix 3

Table 25 The Kendall tau-b correlation coefficients between the construct relating to diversification for the Finnish sample

	Capital under management	Preferred industry diversification	Industry HHI	Preferred geographic scope	Preferred stage index
Preferred industry diversification	-,054 sig ,360				
Industry HHI	-,024 sig ,440	-,198 sig ,124			
Preferred geographic scope	,506** sig ,000	-,011 sig ,473	,088 sig ,298		
Preferred stage index	,213 sig ,078	-,162 sig ,163	,364* sig ,016	,020 sig ,449	
Operational stage index	,133 sig ,229	-,010 sig ,479	,209 sig ,130	,114 sig ,276	,338 sig ,039

Table 26 The Kendall tau-b correlation coefficients between the construct relating to diversification for the Israeli sample

	Amount of fund capital	Preferred industry diversification	Industry HHI	Preferred geographic scope
Preferred industry diversification	0,164* sig. ,032			
Industry HHI	-0,197* sig. ,040	-0,376** sig. ,000		
Preferred geographic scope	0,134 sig. ,082	-,180* sig. ,032	,180 sig. ,071	
Preferred stage index	0,101 sig. ,126	,249** sig. ,000	-0,110 sig. ,168	-,137 sig. ,077

Appendix 4

Table 27 Results of the normality test for the Finnish sample

Variable	Skewness	Kurtosis	Kolmogorov-Smirnow Z	Significance (2-tailed)
Amount of capital under management	3,477	13,727	1,857	,002
Amount of capital under management transformed	0,134	-0,672	,556	,916
Industry HHI	0,258	-0,984	,648	,795
Preferred geographic scope	0,334	-1,306	1,108	,172
Preferred stage index	-0,716	0,957	,980	,292
Actual number of portfolio companies	2,764	8,706	1,243	,091
Actual number of portfolio companies transformed	0,539	-0,257	,469	,981

Table 28 Results of the normality test for the Israeli sample

Variable	Skewness	Kurtosis	Kolmogorov-Smirnow Z	Significance (2-tailed)
Amount of fund capital	3,225	13,249	2,473	,000
Amount of fund capital transformed	0,299	0,144	,996	,274
Industry HHI	1,415	2,438	,900	,393
Preferred geographic scope	0,625	1,618	3,196	,000
Preferred stage index	0,154	-1,059	1,112	,169
Actual number of portfolio companies	1,806	3,559	1,433	,033
Actual number of portfolio companies transformed	0,061	0,016	,533	,939

Appendix 5

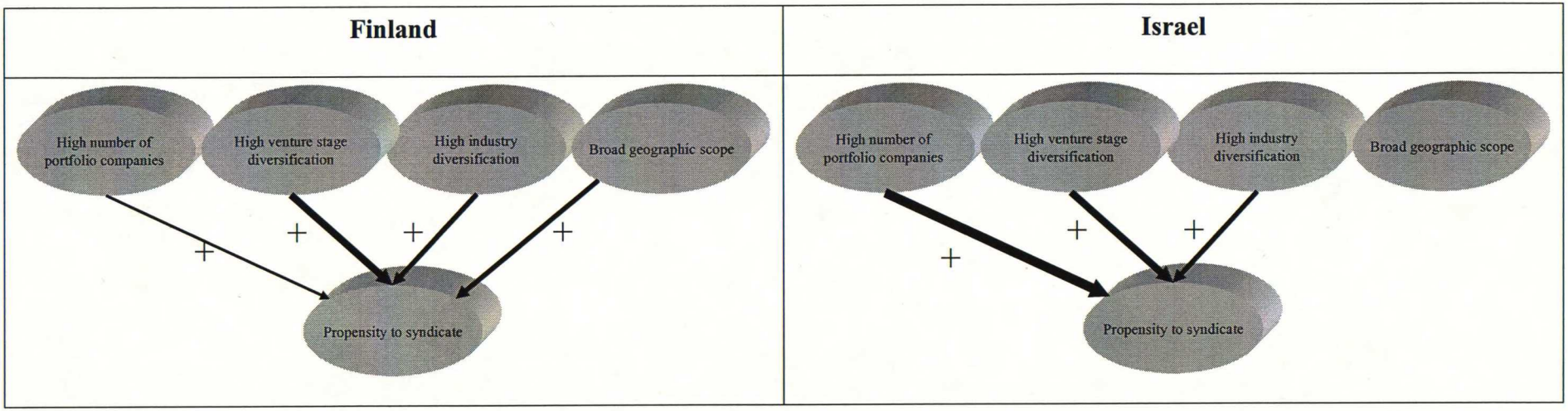

Figure 41 The relationships between diversification and syndication for the sample countries

The thickness of the arrow represents the strength of the relationship. The signs next too the arrows indicate the positive or negative relationships between the variables.

Appendix 6

Table 29 The Kendall tau-b correlation coefficients between the construct relating to VCFs' propensity to syndicate and industry and venture stage characteristics for the Finnish sample

Finland		Actual number of portfolio companies	Capital under management	Industry HHI	Preferred stage diversification	Stage index
Propensity to syndicate	Correlation Coefficient	,211	0,125	-0,159	0,037	0,129
	Sig. (1-tailed)	0,099	0,226	0,164	0,418	0,236
	N	21	20	21	20	20

Table 30 The Kendall tau-b correlation coefficients between the construct relating to VCFs' propensity to syndicate and industry and venture stage characteristics for the Israeli sample

Israel		Actual number of portfolio companies	Fund capital	Industry HHI	Preferred stage diversification	Stage index
Propensity to syndicate	Correlation Coefficient	,210(*)	0,127	-0,163	0,060	0,118
	Sig. (1-tailed)	0,020	0,130	0,054	0,304	0,151
	N	48	40	48	43	40

Table 30 gives further evidence that company-, and industry-diversification is positively related to the propensity to syndicate for the Israeli sample.